OMRON

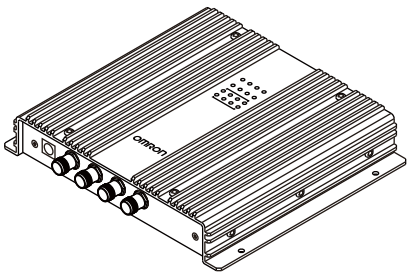
UHF RFID System

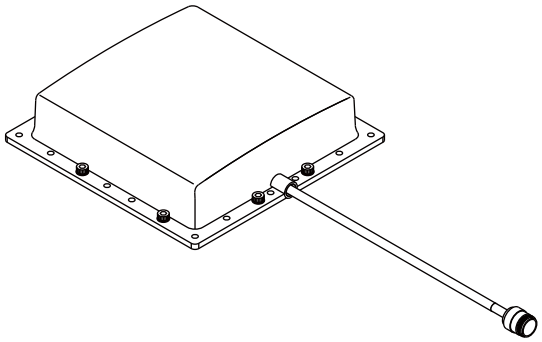
# V750 Series

## User's Manual

Reader/Writer/Antenna

V750-BA50C04-US (Mono-static Reader/Writer)
V740-HS01CA (Circular Antenna)
V740-HS01LA (Linear Antenna)





Man. No.: Z235-E1-01

# Introduction

Thank you for purchasing an ID Sensor Unit for a V750-series RFID System. This manual describes the functions, performance, and application methods needed for optimum use of your V750-series RFID System.

Please observe the following items when using the V750-series RFID System.

- Allow the V750-series RFID System to be installed and operated only by qualified specialist with a sufficient knowledge of electrical systems.
- Read and understand this manual before attempting to use the V750-series RFID System and use the V750-series RFID System correctly.
- Keep this manual in a safe and accessible location so that it is available for reference when required.

| | |
|---|---|
| Introduction | READ AND UNDERSTAND THIS DOCUMENT |
| Section 1 | Features and System Configuration |
| Section 2 | Specifications and Performance |
| Section 3 | Mode and Function |
| Section 4 | Diagnosis and Maintenance |
| Section 5 | Command Line Interface |
| Section 6 | Browser-Based Interface |
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| Section 9 | Appendices |




# RFID System

V750-BA50C04-US Reader/Writer
V740-HS01CA Normal type Circular Antenna
V740-HS01LA Normal type Linear Antenna

# User's Manual

## READ AND UNDERSTAND THIS DOCUMENT

Please read and understand this document before using the products. Please consult your OMRON representative if you have any questions or comments.

## WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

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## SUITABILITY FOR USE

THE PRODUCTS CONTAINED IN THIS DOCUMENT ARE NOT SAFETY RATED. THEY ARE NOT DESIGNED OR RATED FOR ENSURING SAFETY OF PERSONS, AND SHOULD NOT BE RELIED UPON AS A SAFETY COMPONENT OR PROTECTIVE DEVICE FOR SUCH PURPOSES. Please refer to separate catalogs for OMRON's safety rated products.

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the product.

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The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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## CHANGE IN SPECIFICATIONS

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It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the product may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

## DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

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# Safety Precautions

● Signal Words Used in This Manual

The following signal words and symbols are used in this manual to indicate precautions that must be observed to ensure safe use of the V750-series Reader/Writer Unit. The precautions provided here contain important safety information. You must observe these precautions.

The following signal words and symbols are used in this manual.

| | |
|---|---|
| ⚠WARNING | Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage. |
| ⚠CAUTION | Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage. |

● Meanings of Alert Symbols

| | |
|---|---|
| | **General Caution**<br>Indicates general cautionary, warning, or danger level information. |
| | **Electrical Shock Caution**<br>Indicates possibility of electric shock under specific conditions. |
| | **General Prohibition**<br>Indicates a general prohibition. |
| | **Disassembly Prohibition**<br>Indicates that disassembly is prohibited to prevent electric shock. |
| | **General Mandatory Action**<br>Indicates a general action that must be performed by the user. |
| | **Ensure to establish a solid grounding**<br>A label indicating that a device with a grounding terminal should always be grounded. |

● Warnings

| ⚠WARNING | |
|---|---|
| Never attempt to disassemble any Units while power is being supplied. Doing so may result in serious electrical shock or electrocution. | |
| Never touch any of the terminals while power is being supplied. Doing so may result in serious electrical shock or electrocution. | |
| This Product is not designed or rated for ensuring safety of persons. Do not use it for such purposes. | |

# Regulatory Compliance

1. EMC

47 CFR, Part 15
RSS210
COFETEL: RCPOMV708-0153

**FCC WARNING**

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**FCC COMPLIANCE**

This equipment complies with Part 15 of the FCC rules for intentional radiators and Class A digital devices when installed and used in accordance with the operation manual. Following these rules provides reasonable protection against harmful interference from equipment operated in a commercial area. This equipment should not be installed in a residential area as it can radiate radio frequency energy that could interfere with radio communications, a situation the user would have to fix at their own expense.

**COFETEL WARNING**

This equipment operates on a secondary basis and, consequently, must accept harmful interference, including from station of the same kind, and may not cause harmful interference to systems operating on a primary basis.

**EQUIPMENT MODIFICATION CAUTION**

Equipment changes or modifications not expressly approved by OMRON Corporation, the party responsible for FCC compliance, could void the user's authority to operate the equipment and could create a hazardous condition.

**IMPORTANT USER INFORMATION**

This equipment complies with FCC radiation exposure limits set forth for uncontrolled equipment and meets the FCC radio frequency (RF) Exposure Guidelines in Supplement C to OET65. This equipment should be installed and operated with at least 23cm (9.1in) and more between the radiator and person's body (excluding extremities: hands, wrists, feet and legs).

This device complies with RSS-Gen of IC Rules. Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of this device.

2. Safety

UL 60950
Can/CSA C22.2 No 60950

**IMPORTANT USER INFORMATION**

(1) For products numbered with 0001X06 to 0048X06, only AC adapter complies with UL 60950. For products numbered with 0049X06 or later, AC adapter and the V750 Reader/Writer comply with UL 60950.
(2) Products numbered with 0341308 or later comply with COFETEL certification.
(3) Product number consists of following data of seven digits.

**AAAA B CC**

AAAA :Serial number. 0001 to 9999. (except for specially specified product)
B :Month, 1 to 9, X, Y, and Z; X=10, Y=11, Z=12
CC :Year

# Precautions for Safe Use

Be sure to observe the following precautions to ensure safe use of the Product.

1. Locations exposed to any flammable gasses, corrosive gasses, dust, metallic powder, or salts
2. Tighten the Backplane mounting screws and terminal block screws securely.
3. If any cable has a locking mechanism, make sure that it has been locked before using the cable.
4. Do not apply voltages to the input terminals in excess of the rated input voltage.
5. Do not allow water or wires to enter the Product through gaps in the case. Otherwise, fire or electric shock may occur.
6. Turn OFF the power to the Product before attaching or removing an Antenna.
7. If an error is detected in the Product, immediately stop operation and turn OFF the power supply. Consult with an OMRON representative.
8. Dispose of the Product as industrial waste.
9. Observe all warnings and precautions given in the body of this manual.

# Precautions for Correct Use

Always observe the following precautions to prevent operation failure, malfunctions, and adverse effects on performance and equipment.

1. Do not use non-waterproof Products in an environment where mist is present. (For Reader/Writer and normal type Antennas)
2. Do not expose the Products to chemicals that adversely affect the Product materials.
3. The transmission distance will be reduced if the front and back panels are mistakenly reversed and the Unit is mounted to a metallic surface.
4. The transmission distance will be reduced when the Unit is not mounted to a metallic surface.
5. RF Tag cannot be washed the high temperature.
6. Do not drop the device you may receive major shocks. Doing so may result in personal injury or device damage.
7. Do not apply strong force to, or place heavy items on the device or cables. Doing so may deform or damage the device, resulting in electric shock or fire.
8. Use and store the product in an environment that is specified in the catalog or User's manual. Failure to do so may cause failure of the device, electric shock, or fire.
9. When transporting the Units, use special packing boxes.
10. Be careful not to apply excessive vibration or shock, or not to expose to water during transportation and not to drop the product.
11. Provide an enough space around the device for ventilation.
12. Be sure to use wiring cable of the specified size for wiring. Failure to do so may cause failure of the device, electric shock, or fire.
13. AC adaptor of the attachment is used without fail. Failure to do so may cause failure of the device, electric shock, or fire.
14. After the DC connector side is connected, the AC100V side is connected when the AC adaptor is connected. Failure to do so may cause failure of the device, electric shock.
15. The product uses a publicly available ISM frequency band of 902-928MHz to communicate with Tags. Some transceivers, motors, monitoring devices, power supplies, and other similar RFID systems may generate noise, which cause radio interference and may affect communication with Tags. If the product is required in the vicinity of these items, check for any interferences prior to use.
    Observe the following precautions to minimize the effects of normal noise.
    (1) Ground the ground terminal on the Product and all metal objects in the vicinity of the Product to 100 Ω or less.
    (2) Do not use the Product near high-voltage or high-current lines.
16. Do not allow the device or cables to be exposed to water. Doing so may result in electric shock, fire or failure of non-waterproof devices or cables.
17. Do not use damaged cables. Continued use of the damaged cables may result in electric shock or fire.
18. It is not possible to connect it with Reader/Writer excluding the specified antenna.
19. Be sure that all the mounting screws, terminal screws, and cable connector screws are tightened to the torque specified in the relevant manuals.Incorrect tightening torque may result in malfunction.

## ■ Storage

Do not store the Product in the following locations.

- Locations exposed to corrosive gases, dust, metallic powder, or salts
- Locations not within the specified operating temperature range
- Locations subject to rapid changes in temperature or condensation
- Locations not within the specified storage humidity range
- Locations subject to direct vibration or shock outside the specified ranges
- Locations subject to spray of water, oil, or chemicals

## ■ Cleaning

- Do not clean the Products with paint thinner or the equivalent. Paint thinner, benzene, acetone, and kerosene or the equivalent will dissolve the resin materials and case coating.

# Meanings of Symbols

Indicates particularly important points related to a function, including precautions and application advice.

Indicates page numbers containing relevant information.

Indicates reference to helpful information and explanations for difficult terminology.

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# SECTION 1
# Features and System Configuration


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# Features

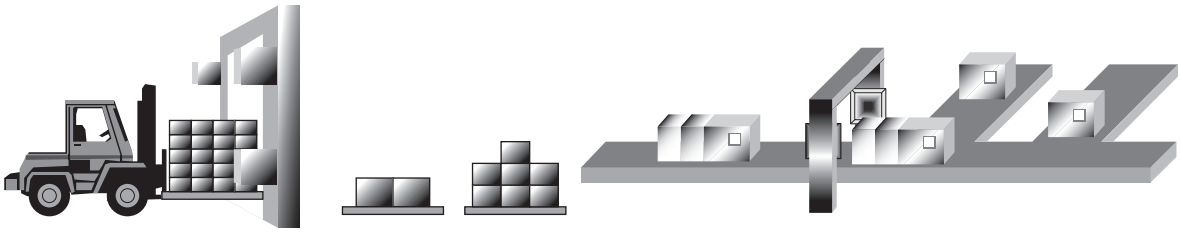
The OMRON V750 RFID Reader (herein after denoted as the reader) uses RFID (radio frequency identification) technology to read data stored on RFID tags.
The reader supports UHF (ultra high frequency) antennas, which are available separately. The reader receives tag data through the UHF antenna and transfers data to a remote computer over a network connection.

## ■ Main Features

(1) Well-tuned communication performance and functions for customers' applications

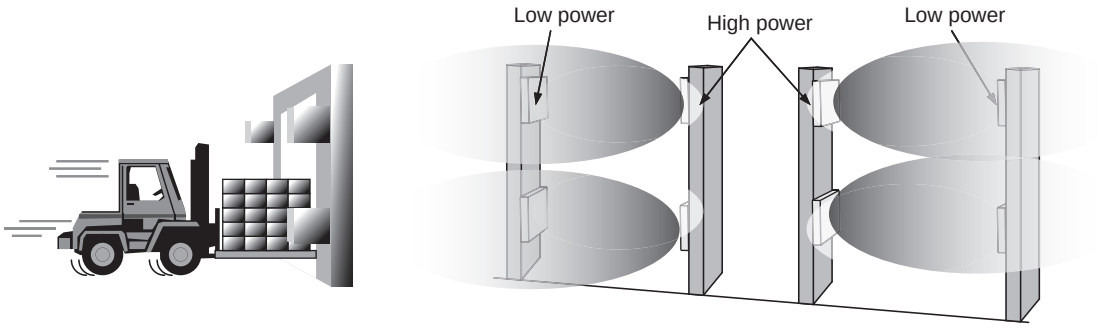
1) Selective communication modes for various applications

Single access mode: reads a tag in high speed if there is a single tag in the communication field.
Multi access mode: optimizes a sequence automatically according to the number of tags existing in the communication field.



2) Various communication condition setting

Multiple communication conditions suit user's optional usage.




3) Self-operation function

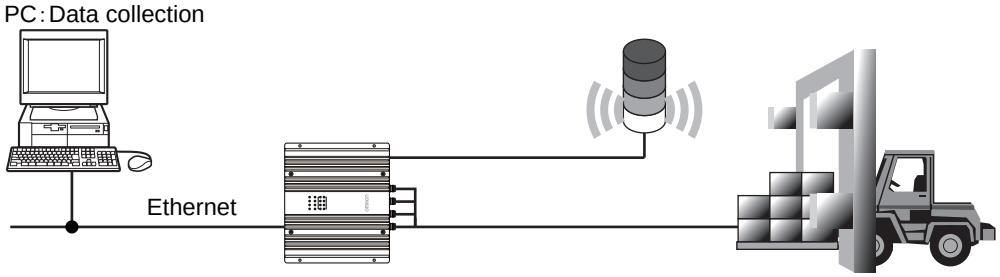
Using two function; command entry function and programmable output function, the reader can implement simple judgment or processing without instruction from the host.

-Command entry

Can set a command so that the command starts when power is turned on or input terminal signal is on.

-Programmable output

4 outputs can be used for output terminals to show reader status or communication results. When the output terminal is used for communication results, the result conditions can be set by choosing criteria objective such as data value or tag count.



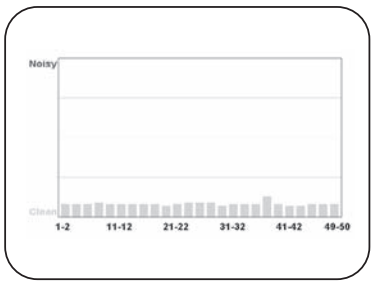
(2) Rich maintenance functions and on-site verification functions

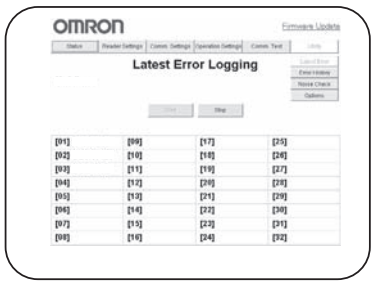
1) Monitoring and setting via Web browser.

Via Web browser, you can get an operation status or setting conditions and set the operation parameters easily.

2) Communication monitoring function that reduces the installation time

A tag communication testing function, an on-site environmental monitoring function (a noise check for each channel), and an error logging function are equipped. These functions show the status of radio waves and enable you to verify performance of tag-reader or analyze phenomena that may change depending on on-site RF environment.



3) Multiple LED operation displays

The multiple LED indicators show the reader operation status clearly and simply so that you can understand the status and handle an error quickly if it happens to occur.

4) Automatic antenna detection

This function enables you to check the connection status of antennas when a command is executed. It helps to detect an error or problem of antenna(s) or wiring.

(3) Expandability applicable to broad usage

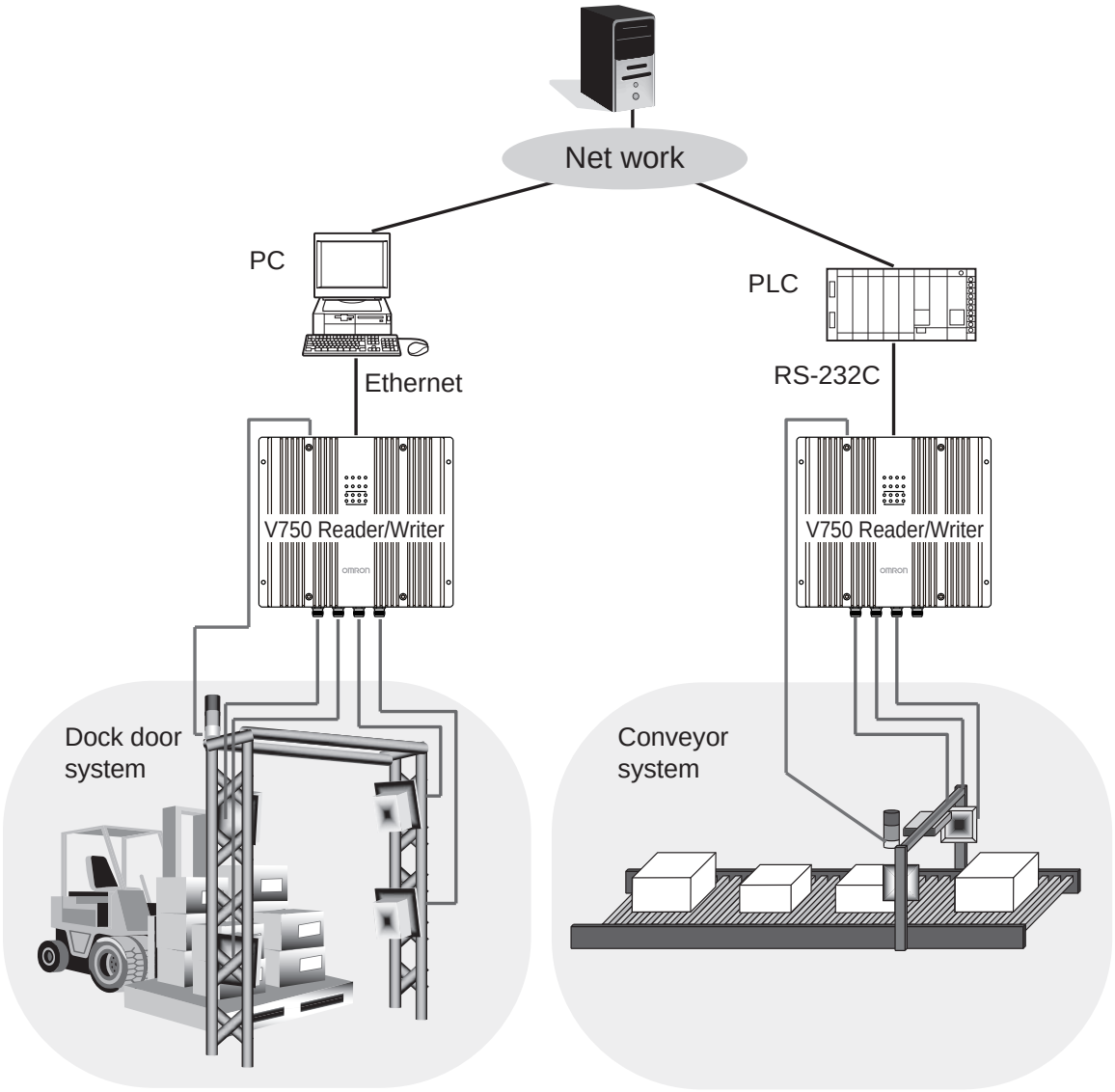
Firmware upgradable

Via Web browser on the PC, you can upgrade its firmware. It means that the functions are expandable.

# System Configuration

## System example for logistic tracking application

V750-series Radio wave propagative RFID system is ideal for long range communication and for the system construction used in the production process or distribution control.
It is designed to have "High read range", "Quick response" and "Simple operation".

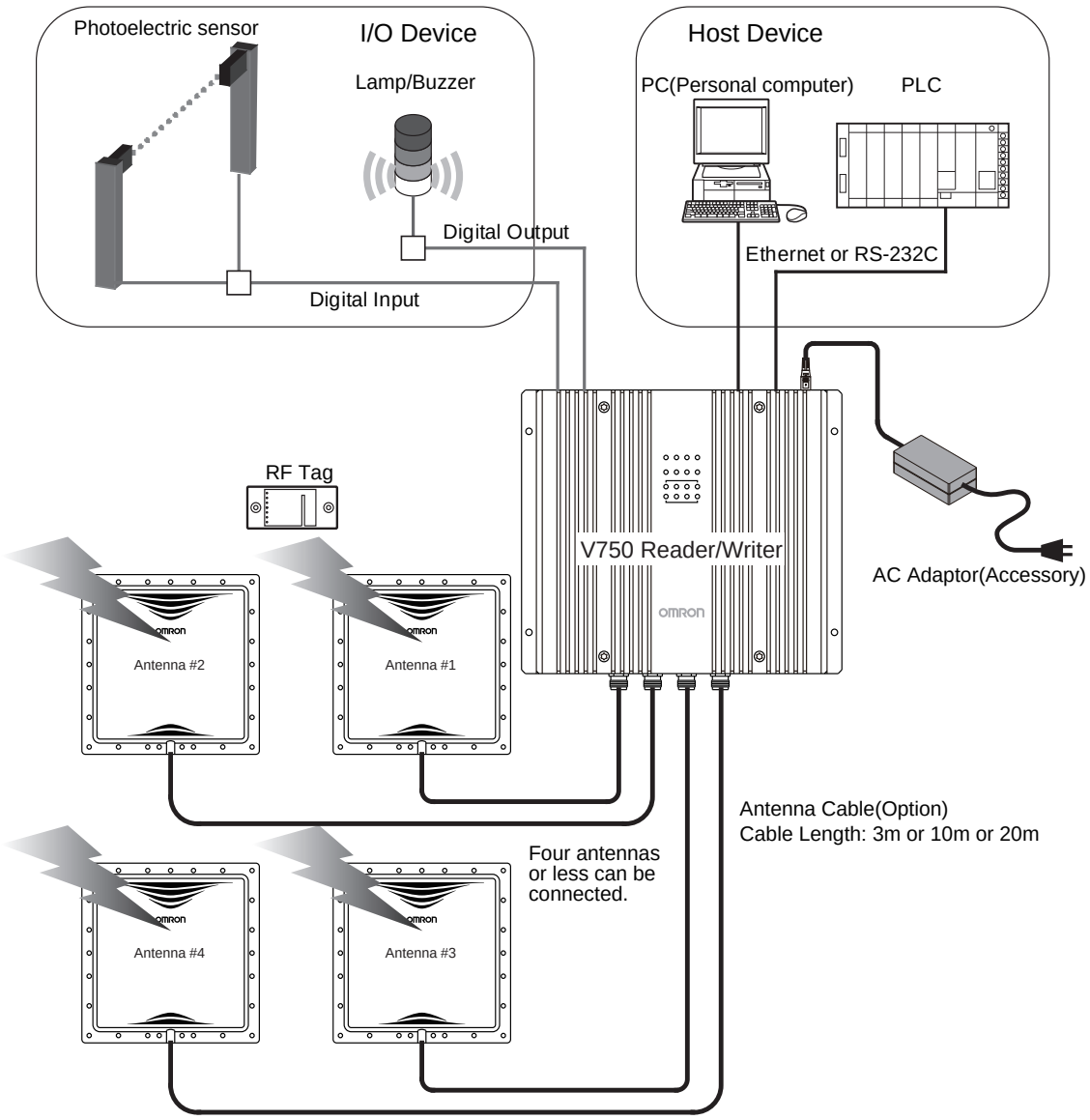



CHECK!

Multiple readers and antennas located in proximity or other UHF readers and antennas at neighborhood may cause intereferences for detoriating communication performance. Please check your operating environmental before you start to use.

# System Configuration

Max.imum 4 antennas can be connected to the reader. Sensor input can be applied to external inputs at the reader as a trigger input for starting communication with the tag, and then it can output to its external outputs for controlling such as indicators or buzzer according to its communication results.



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# SECTION 2
# Specifications and Performance


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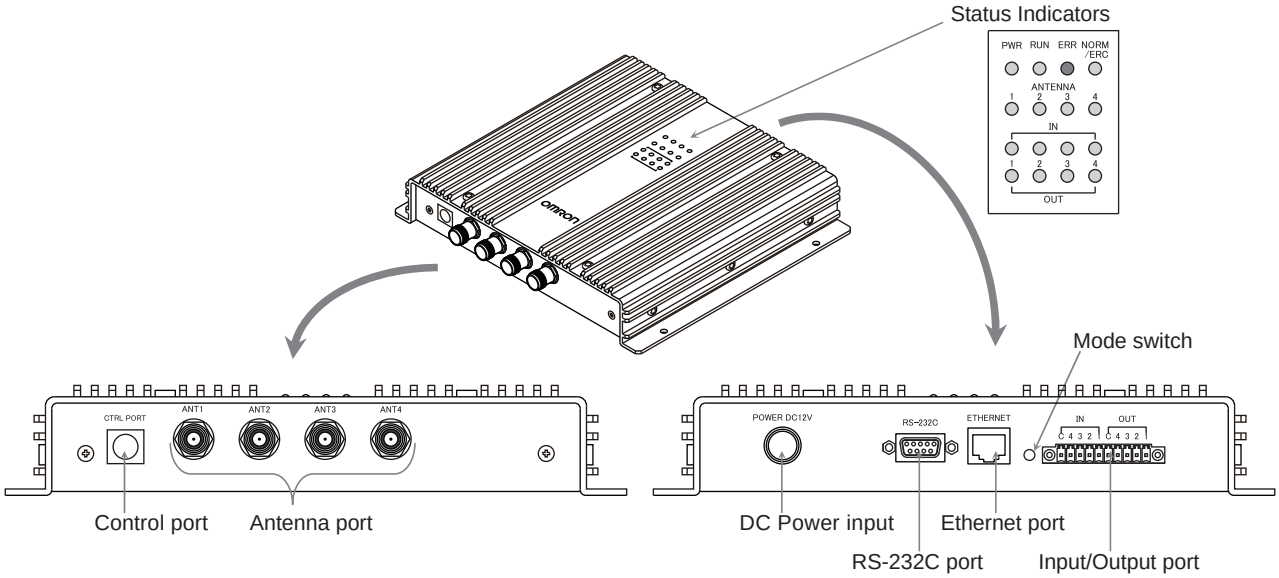
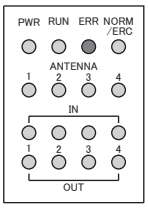
# Reader

## Names and Functions of Components




| Name | Function | Connector specifications |
|---|---|---|
| Antenna port [ANT1-ANT4] | Connects with UHF mono-static type antenna specified by OMRON via antenna cables.Max 4 antennas can be connected to. | Reverse TNC |
| Control port [CTRL PORT] | For future expansion. | Exclusive connector |
| DC Power input [POWER DC12V] | Connects with the attachment AC adaptor to receive +12V electric power.* Extension of AC adaptor cable is not allowable. | Exclusive connector |
| RS-232C port [RS-232C] | Connects with the host via a commercially available RS-232C cable for DOS/V PC. | D-sub 9pin (male) Inch screw (#4-40) |
| Ethernet port [ETHERNET] | Connects with the host via a commercially available 10/100Base-T cable. | RJ-45 LED Left: Link, Right: Act |
| Input/Output port [IN 1,2,3,4,C] [OUT 1,2,3,4,C] | Connects to the input/output signal cable(s) via an attached I/O port adapter (MC 1,5/10-STF-3,81).4 Inputs: connects with the sensor that works as a trigger signal for communication start.4 Outputs: connects with the light or actuator that is driven by output signal. | MC 1,5/10-GF-3.81 (produced by PHOENIX CONTACT). |
| Mode switch (Not indicated) | Pushing this button for 1 second or more makes the system rebooting with default setting, which will be functional in case of system error or setting unknown. | --- |
| Status Indicators  | PWR:<br>RUN:<br>ERR:<br>NORM/ERC:<br>ANTENNA:<br>IN:<br>OUT: | ---- |



**Note:** The high-speed mode cannot be used by the controller's setting.

CHECK!

- Antennas other than V740-HS01CA/HS01LA cannot be connected.
- The antenna cable must use an optional special antenna cable.
- The AC adaptor must use the AC adaptor of the attachment.
- The external I/O connector must use the terminal stand plug of the attachment.

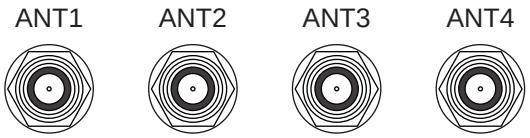
# Connectors

Pin number for each connectors represents its pin allocation from the external view of the reader.

(1) Antenna Port

The antenna port is used to connect the antenna cable.

■ **Connector:Reverse TNC**

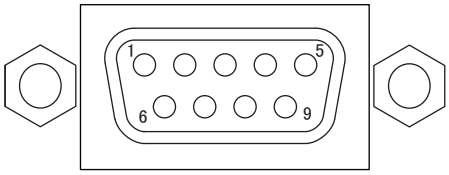



| Name | Function |
|---|---|
| SG | Signal output |
| GND | Ground |

(2) RS-232C Interface

This port is used to connect the reader to the host containing RS-232C interface such as PC or PLC (Programmable logic controller). If you use the PC as a host, prepare a cross cable to connect the PC to the port.

■ **Connector: D-sub 9pin (male), inch screw (#4-40)**

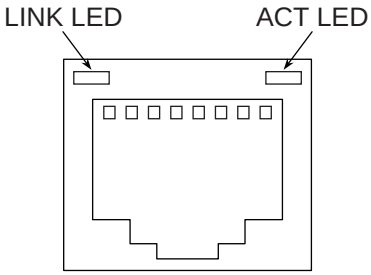



| Pin No. | Name | Function | I/O |
|---|---|---|---|
| 1 | --- | --- | --- |
| 2 | RD | Receive Data | IN |
| 3 | SD | Send Data | OUT |
| 4 | --- | --- | --- |
| 5 | SG | Signal Ground | --- |
| 6 | --- | --- | --- |
| 7 | RS | Request to Send | OUT |
| 8 | CS | Clear to Send | IN |
| 9 | --- | --- | --- |

(3) Ethernet Interface

This port is used to connect the host to the reader via Ethernet. To connect them, use the commercial cable 10/10Base-T.

■ **Connector: RJ-45 (8 pin)  LED: Link (green) /Act (orange)**



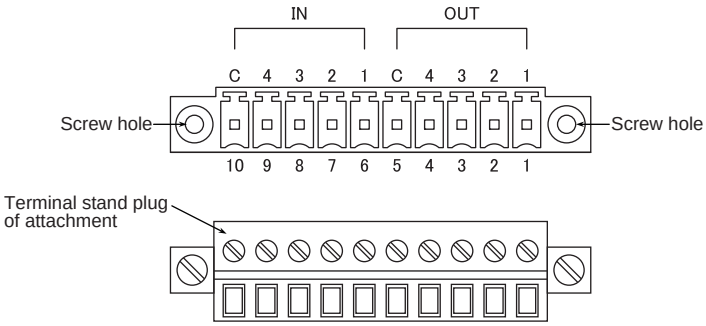

| Pin No. | Name | Function | I/O |
|---|---|---|---|
| 1 | TXD(+) | Transmit Data + | OUT |
| 2 | TXD(-) | Transmit Data - | OUT |
| 3 | RXD(-) | Receive Data - | IN |
| 4 | Not used | Reserved | --- |
| 5 | Not used | Reserved | --- |
| 6 | RXD(+) | Receive Data + | IN |
| 7 | Not used | Reserved | --- |
| 8 | Not used | Reserved | --- |

(4) I/O Interface

As an input/output port, the reader contains a terminal block of which connector is removable with screws.

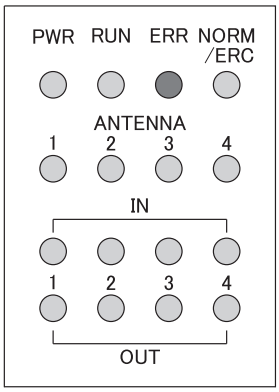
Terminal block connector: MC 1,5/10-STF-3,81 (produced by PHOENIX CONTACT)

■ **Cable fixing screws x 10**




| Pin No. | Name | Function | I/O |
|---|---|---|---|
| 1 | OUT1 | Output port#1 | OUT |
| 2 | OUT2 | Output port#2 | OUT |
| 3 | OUT3 | Output port#3 | OUT |
| 4 | OUT4 | Output port#4 | OUT |
| 5 | OUT_COM | Output common port | --- |
| 6 | IN1 | Input port#1 | IN |
| 7 | IN2 | Input port#2 | IN |
| 8 | IN3 | Input port#3 | IN |
| 9 | IN4 | Input port#4 | IN |
| 10 | IN_COM | Input common port | --- |

(5) Status Indicators




| Indicator | | Name | Color | Status | Meaning |
|---|---|---|---|---|---|
| PWR | | Power | Green | ON | Normally energized. |
| RUN | | Running | Green | ON | Normally running. |
| | | | | Flashing (Short interval)* | Boot processing |
| | | | | Flashing (Long interval)** | Safe Mode running |
| ERR | | Reader error<br><br>RUN indicator off<br>:Unrecoverable error<br><br>RUN indicator on<br>:Recoverable error | Red | ON | System error.The error has occurred and it stopped the system operation.<br>ex. System error |
| | | | | Flashing (Short Interval)* | Setting error.The error has occurred and it stopped by settings.<br>ex. Power shut down in command communication<br>ex. Communication setting error<br>ex. Disconnection to the DHCP server |
| | | | | Flashing (Long interval)** | Waiting for network connection. |
| NORM/ ERC | | Communication result<br>:Normal end | Green | ON | Command executed or communication with tag completed normally.<br>(Turns off after 50ms ON or upon ERR LED turns on.) |
| | | Communication result<br>:Error of Communication | Red | ON | Command executed or communication with tag completed abnormally.<br>(Turn off after 50ms ON or upon NORM LED turns on.) |
| Antenna Port | 1 | Antenna port #1 | Orange | ON | Communication process is running via antenna #1.When connecting with an antenna via antenna #1 is detected after power turns on, it lights for 50ms. |
| | 2 | Antenna port #2 | Orange | ON | Communication process is running via antenna #2.When connecting with an antenna via antenna #2 is detected after power turns on, it lights for 50ms. |
| | 3 | Antenna port #3 | Orange | ON | Communication process is running via antenna #3.When connecting with an antenna via antenna #3 is detected after power turns on, it lights for 50ms. |
| | 4 | Antenna port #4 | Orange | ON | Communication process is running via antenna #4.When connecting with an antenna via antenna #4 is detected after power turns on, it lights for 50ms. |
| Input Port | 1 | Input port #1 | Green | ON | Signal of input port #1 is on |
| | 2 | Input port #2 | Green | ON | Signal of input port #2 is on |
| | 3 | Input port #3 | Green | ON | Signal of input port #3 is on |
| | 4 | Input port #4 | Green | ON | Signal of input port #4 is on |
| Output Port | 1 | Output port #1 | Green | ON | Signal of output port #1 is on |
| | 2 | Output port #2 | Green | ON | Signal of output port #2 is on |
| | 3 | Output port #3 | Green | ON | Signal of output port #3 is on |
| | 4 | Output port #4 | Green | ON | Signal of output port #4 is on |

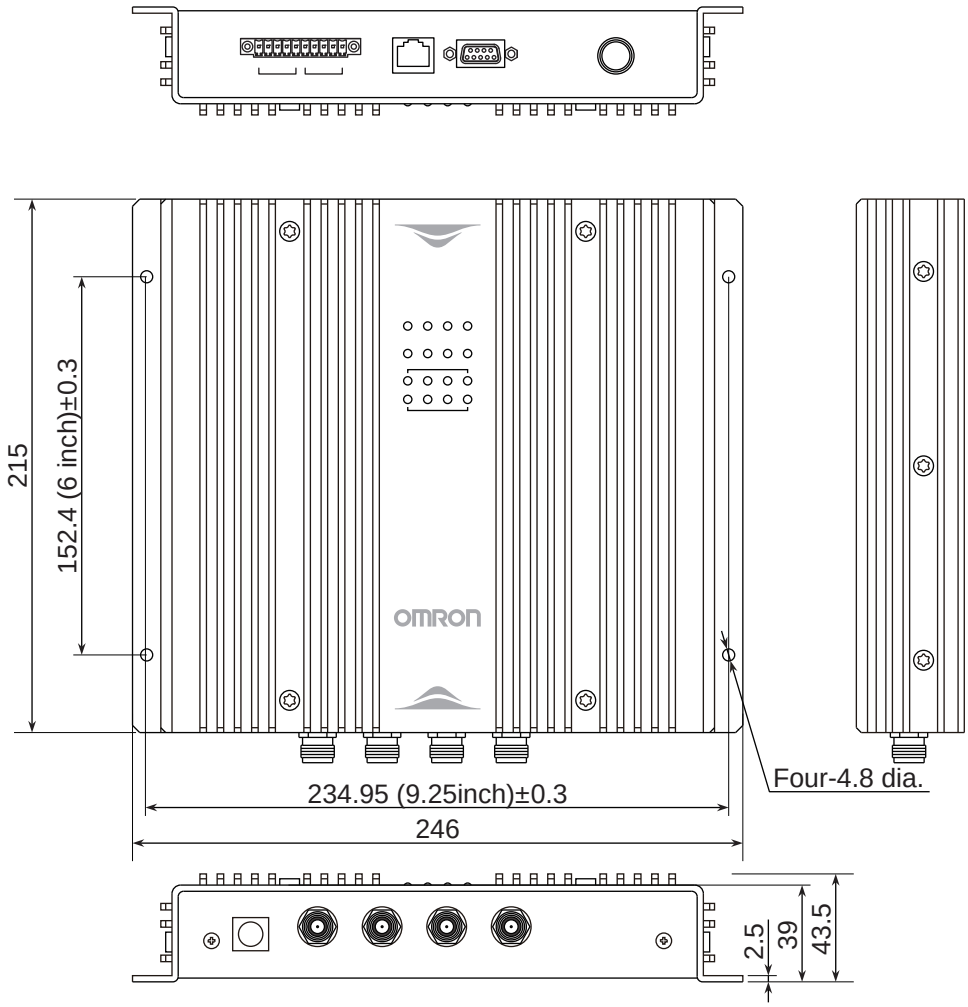
* Short interval: approx. 500ms cycle (On: 250ms, Off: 250ms)

** Long interval: approx. 3000ms cycle (On: 1500ms, Off: 1500ms)

# Demensions

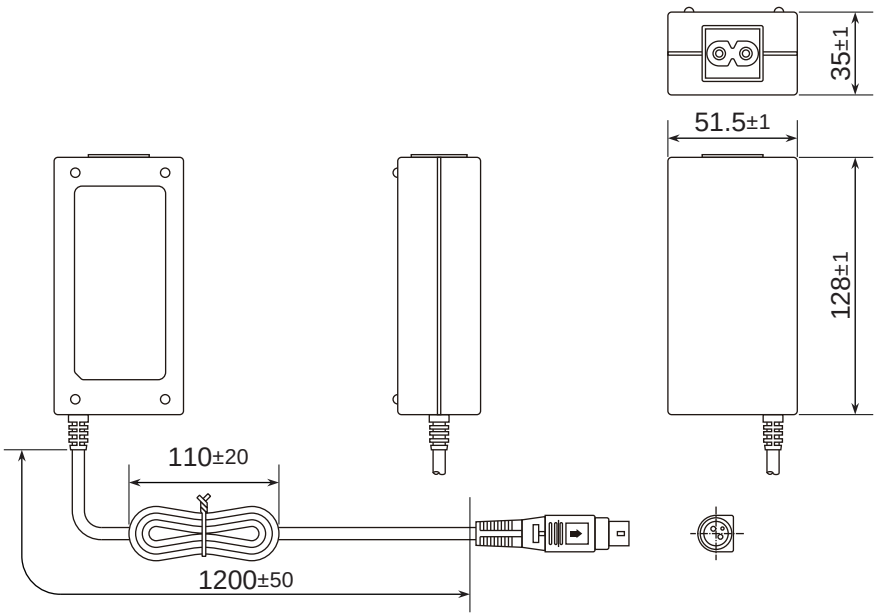
## ■ V750-BA50C04-US

(Unit:mm)




## ■ AC Adapter

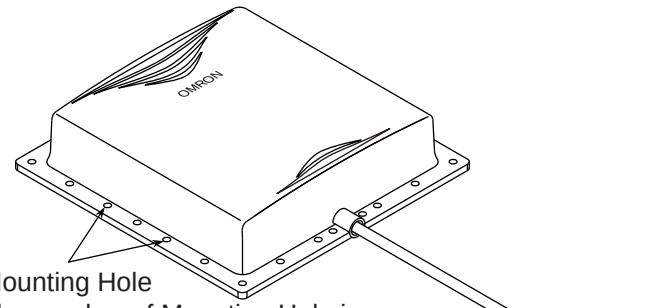
(Unit:mm)



# Antenna

## Name of each part

### ■ V740-HS01CA/V740-HS01LA




Mounting Hole
The number of Mounting Hole is about surrounding four.

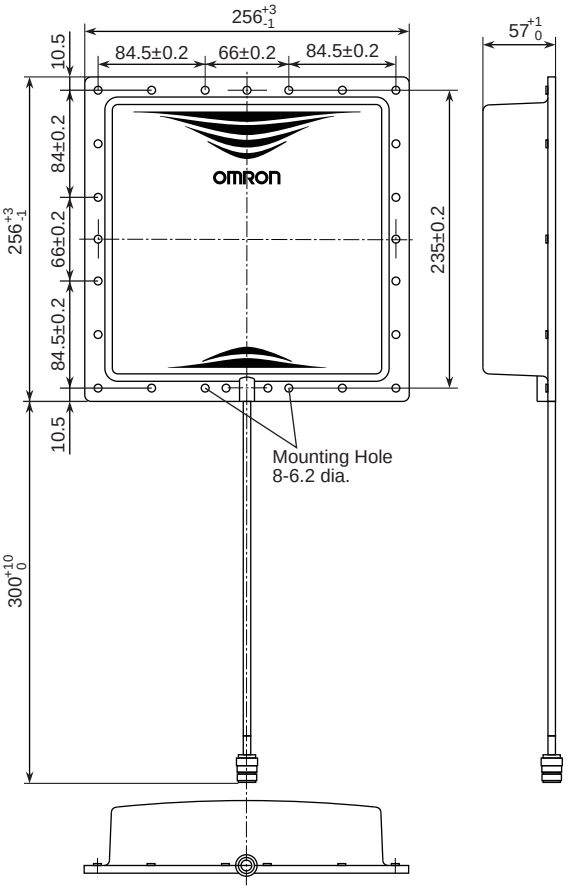
N-Female connector
For connection with Antenna Cable.

### ■ Connector

| Name | Function |
|---|---|
| N-Female connector | Antenna cable is connected with the connector. |

# Demensions

## ■ V740-HS01CA/V740-HS01LA

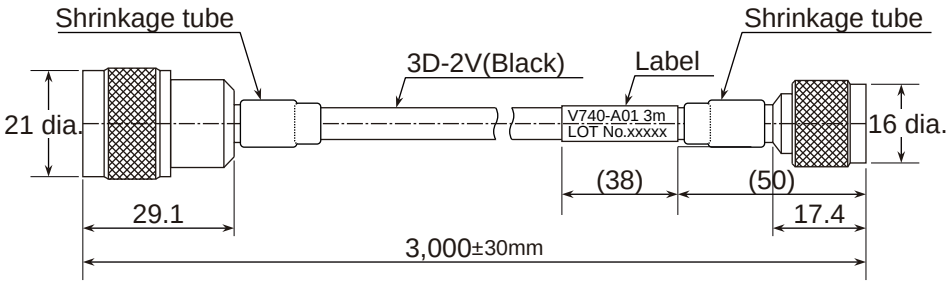


# Antenna Cable

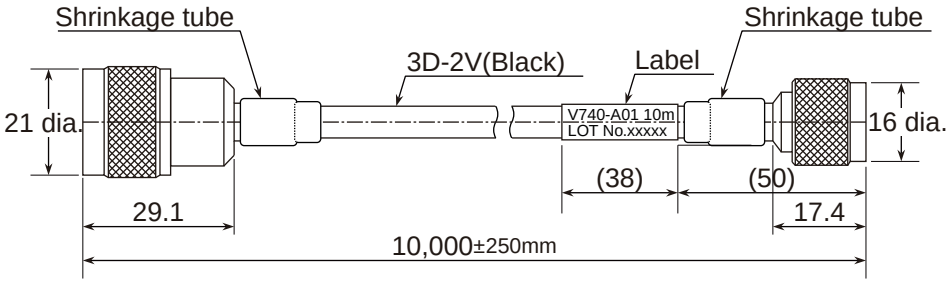
## ■ Demensions

| Item \ model | V740-A01 3M | å`V740-A01 10M | V740-A01 20M |
|---|---|---|---|
| length(L1) | 3000±30(mm) | 10000±250(mm) | 20000±250(mm) |

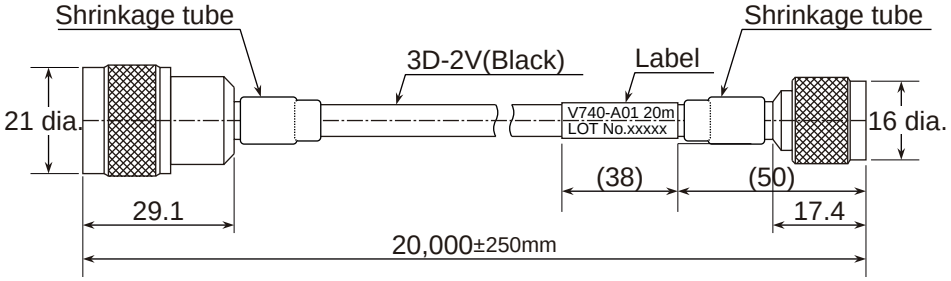
### • V740-A01 3M




### • V740-A01 10M




### • V740-A01 20M




CHECK!

Do not bend antenna cable by force. It could be a cause of beraking a wire.

CHECK!

- Always use V740-A01 3M/10M/20M anntena cable
- Do not change cable length of antenna cable.
- The antenna connector(TNC-typpe and N-type) are not water-proof.
- In case there are possibility to drop of water at anntenas and antenna cables, use water-proof tape at the connector connection portion.

# Specifications

## General Specifications

### ■ Reader/Writer(V750-BA50C04-US)

| Item | | Specification |
|---|---|---|
| Power supply voltage | Reader | 12 VDC, via attached AC Adapter.(Less than 28W) |
| | AC Adapter | 100 to 240 VAC 50/60Hz (0.5 A at 120 V) |
| Power consumption | | 28 W max. |
| Ambient operating temperature | | -10 to 50°C(with no icing) |
| Ambient storage temperature | | 25% to 85%(with no condensation) |
| Ambient storage temperature | | -25 to 65°C(with no icing) |
| Insulation resistance | | 20 MΩ min. (at 100 VDC mega) between connector terminals and case |
| Dielectric strength | | 1,000 VAC, 50/60 Hz for 1 min between connector terminals and case |
| Dielectric strength | | 10 to 150 Hz, 0.2-mm double amplitude, acceleration: 10 sweeps in each of 3 axis directions (up/down, left/right, and forward/backward) for 8 minutes each |
| Shock resistance | | 150 m/s², 3 times each in 6 directions (Total: 18 times) |
| Dimensions | | 246 × 215 × 43.5 mm (W × H × D) |
| Degree of protection | | IP50(IEC60529) |
| Antenna Connections | | 4 channels |
| Case material | | Aluminum |
| Mounting | | 4 point screw(M4) |
| Tightening torque | | 1.2 N·m |
| Weight | | Approx. 1,400 g |

### ■ Normal type Antennas(V740-HS01CA/V740-HS01LA)

| Item | Specification |
|---|---|
| Ambient operating temperature | -15 to 60°C(with no icing) |
| Ambient storage temperature | 25% to 85%(with no condensation) |
| Ambient storage temperature | -25 to 65°C(with no icing) |
| Insulation resistance | 20 MΩ min. (at 100 VDC mega) between connector terminals and case |
| Dielectric strength | 1,000 VAC, 50/60 Hz for 1 min between connector terminals and case |
| Dielectric strength | 10 to 150 Hz, 0.7-mm double amplitude, acceleration: 10 sweeps in each of 3 axis directions (up/down, left/right, and forward/backward) for 8 minutes each |
| Shock resistance | 150 m/s², 3 times each in 6 directions (Total: 18 times) |
| Dimensions | 256 × 256 × 57 mm (W × H × D) (excluding Cable) |
| Degree of protection | IP53(IEC60529) |
| Antenna Connections | 4 channels |
| Material | Case: PVC, Base Panel: Aluminum |
| Mounting | 4 point screw(M6) |
| Tightening torque | 2 N·m |
| Weight | Approx. 800 g |

# Communications Specifications

## ■ Reader/Writer(V750-BA50C04-US)

| Item | Specification |
|---|---|
| Supported tag | EPC global Class1 Generation 2 (C1G2) |
| UHF operating frequency | 902.75-927.25MHz<br>FHSS (Frequency Hopping Spread Spectrum) 50ch |
| Antenna output | 30dBm, 4W EIRP (Changeable for each antennas.) |
| Connected antenna(s) | V740 Series UHF Antenna x 4 ports<br>(V740-HS01CA or V740-HS01LA) |
| Control method | V750 original command/response |
| Control port | Ethernet<br>Supported standard: IEEE802.3 compliance (10Base-T)<br>IEEE802.3u compliance (100Base-TX)<br>Supported protocol: TCP/IP Port:7090 (Changeable) |
| | RS-232C<br>Supported standard: RS-232C compliance<br>Baud rate: 9.6 / 19.2 / 38.4 /57.6 kbps<br>Data length: 7 / 8 bits<br>Parity: Even / Odd / None<br>Stop bit: 1 / 2 bit |
| Browser interface | Ethernet<br>Protocol: HTTP Port:80 (Fixed)<br>TCP/IP Port:7091 (Changeable) |
| Digital Input/Output | 4 Inputs<br>4 Outputs |
| Status indicator | 8 Operation status<br>(POWER, RUN, ERR, NORM/ERC, ANTENNA1-4)<br>4 Inputstatus<br>4 Output status |
| Self diagnostic function | (1) CPU operation check<br>(2) Antenna connecting check<br>(3) Communication error detection with tags |
| Scalability | (1) Software upgradable<br>(2) Antenna control port |

## ■ Antennas(V740-HS01CA/HS01LA)

| Item | Specification | |
|---|---|---|
| | V740-HS01CA | V740-HS01LA |
| Polarization | Circular | Linear |
| Operating frequency | 902-928 MHz | |
| Gain | 6 dBi max. | |
| Impedance | 50 Ω | |
| V.S.W.R | < 1.5 : 1 | |
| Maximum Input Electric power | 1W | |

## ■ Antenna Cables(V740-A01 3M / 10M / 20M)

| Item | Specification | | |
|---|---|---|---|
| | V740-A01 3M | V740-A01 10M | V740-A01 20M |
| Insertion Loss | 1.5 dB min. | | 3.0 dB min. |
| Cable Type | 3D-2V | 5D-SFA | |

Note: Cable Loss for V740-A01 20M cable is about 3.0dB, and communication range was reduced about 80% compare to the 3m and 10m cables

# External I/O Specifications

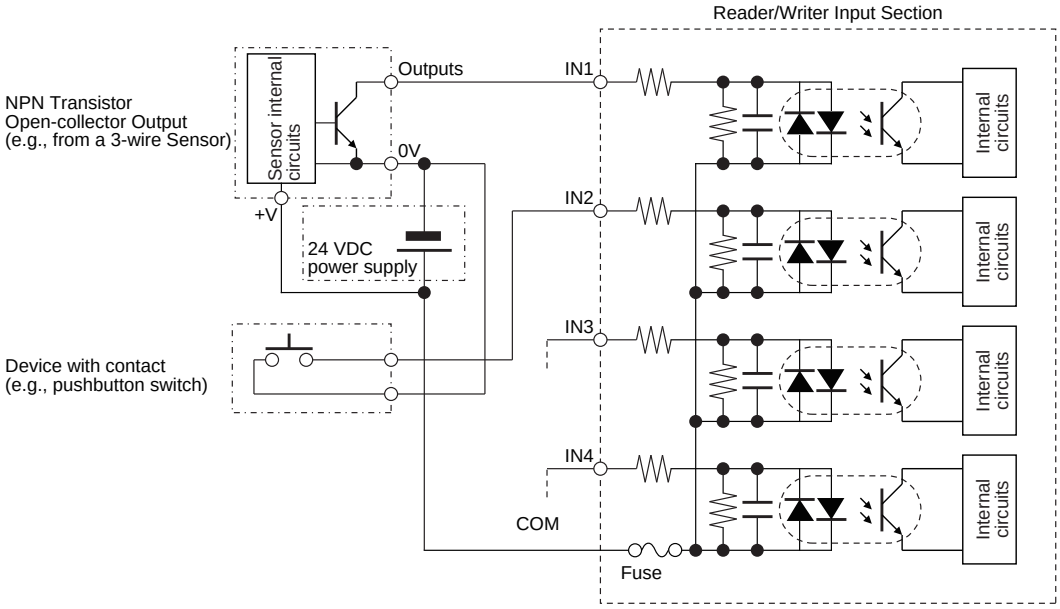
## ■ Input Specifications (IN1, IN2, IN3, IN4)

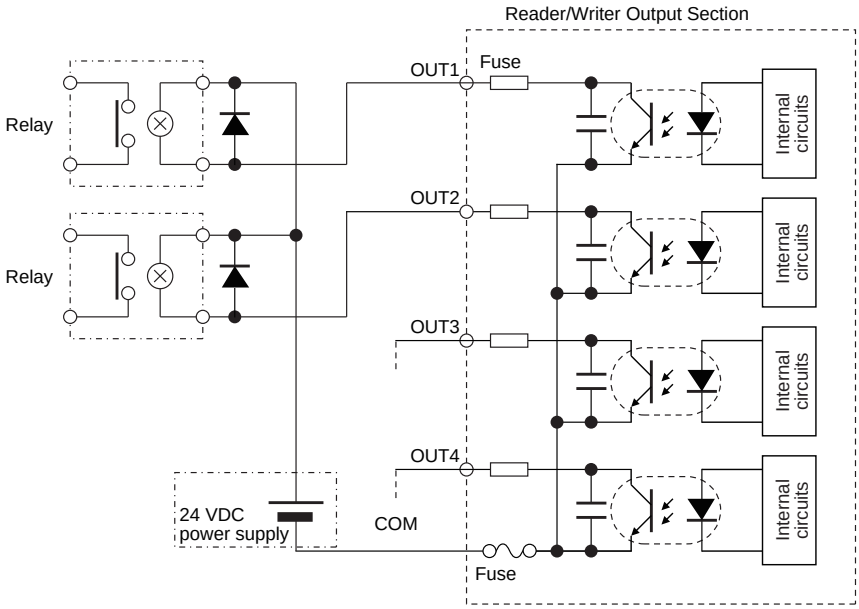
| Item | Specifications |
|---|---|
| Input method | Photo coupler |
| Input voltage | 10.2 to 26.4 VDC (including ripple) |
| Input impedance | 2.35 kΩ TYP. |
| Input current | 4.5 mA TYP.(24VDC)<br>9.8 mA TYP.(24VDC) |

## ■ Output Specifications (OUT1, OUT2, OUT3, OUT4)

| Item | Specifications |
|---|---|
| Output method | Open collector output (Sync type: NPN) |
| Output maximum level | 26.4 VDC (including ripple) |
| Leakage current | 10μA max. |
| Residual voltage | 3 V max.(When output level is 13 mA)<br>2 V max.(When output level is 10 mA) |

## ■ I/O Device Wiring Example




CHECK!

- Do not apply the over rated voltage to the input terminals.
- Do not connect the over voltage for its maximum rateing or load to the output terminals.

# Host communications specifications

The reader can operate with Ethernet or RS-232C serial communiction from host computer or system.

## ■ Ethernet

| Item | Specification |
|---|---|
| Conforming standard | IEEE802.3 compliance (10Base-T)<br>IEEE802.3u compliance (100Base-TX) |
| Protocol | TCP/IP |
| Port | TCP/IP Port: 7090, HTTP Port: 80 |
| Cable length | Marketed range |

## ■ RS-232C

| Item | Specification |
|---|---|
| Conforming standard | RS-232C compliance |
| Baud rate | 9,600 bps, 19,200 bps, 38,400 bps, 57,600 bps |
| Data length | 7/8 bits |
| Parity | Even/Odd/None |
| Stop bit | 1/2 bit |
| Cable length | 15m max. |

CHECK!

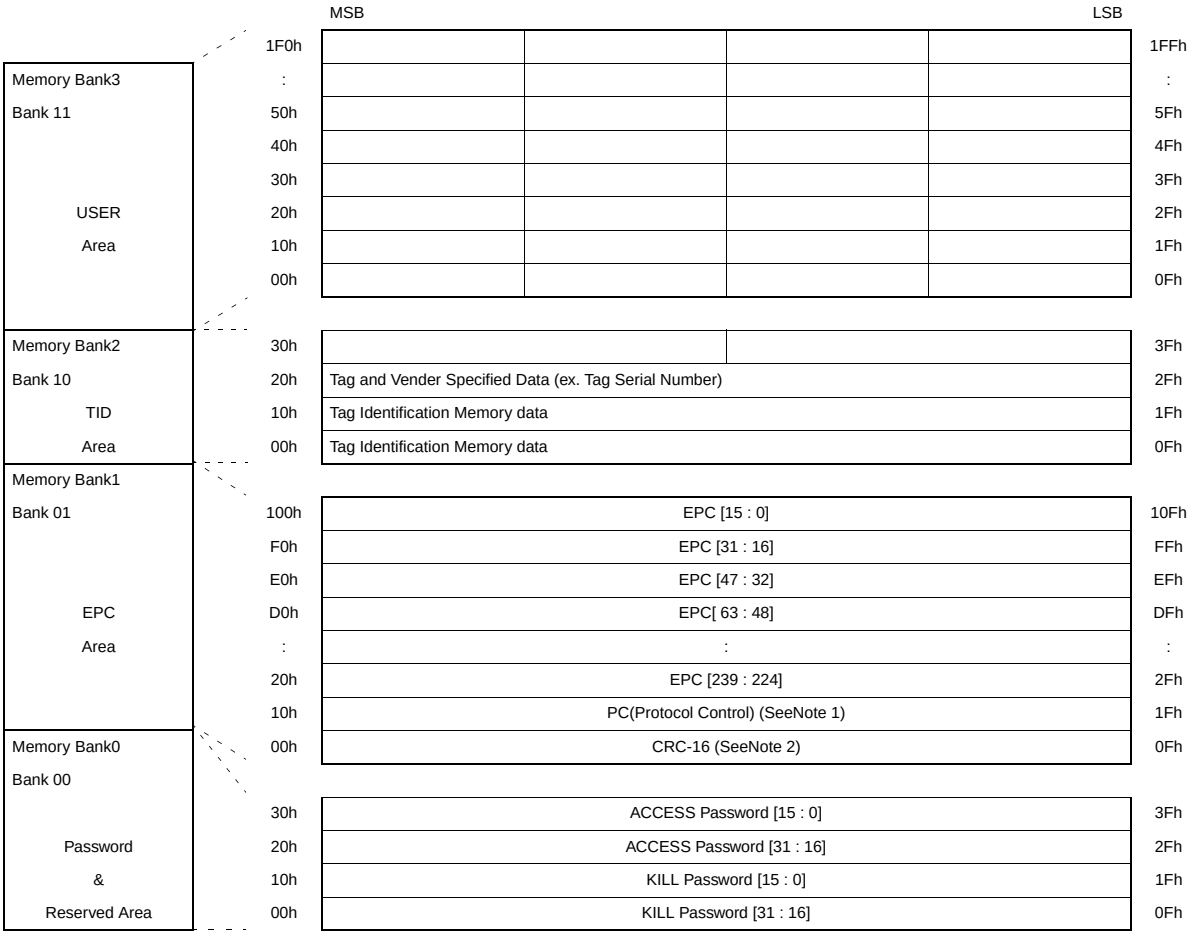
• The length of communication cable may influnces on maxium transmission rate. Please check before operation.

# Gen2 Tags Memory Map

## Gen2 Tags Memory Map

GEN2 tags have four memory banks.
Kill Password and Access Password are stored in bank 00 (Reserved Area), EPC code is in bank 01 (EPC Area), Tag Identification Memory data that is read only is in bank 10 (TID Area). User data is in bank 11 (User Area). For the detailed information refer each tag's specification.






Note 1: Details of PC(Protocol Control)

| 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 1A | 1B | 1C | 1D | 1E | 1F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PC + EPC length<br>16 × (n+1) | | | | | RFU | | 0 : EPC<br>1 : AFI | Data | | | | | | | |

Note 2: CRC16 calculated and stored at the time the tag chip memory powering-up with the data of PC+EPC(only specified length) value.

CHECK!

- Please check before operation when using the other manufacurere tag which comply with EPC global Class1 Generation2(ISO/IEC18000-6 TypeC). Also please refer the memory map specification provided from the IC chip manufacturer.

# Memory Map of the Gen2 Tag(For Impinj Co. MONZA chip. )

Following table shows the memory map of the Gen2 tag(For Impinj Co. MONZA chip.)

| | | | MSB | | LSB |
|---|---|---|---|---|---|
| Memory Bank2 Bank 10 | TID Area 32bit | 10h | Tag Identification Memory (Read only) | | 1Fh |
| | | 00h | Tag Identification Memory (Read only) | | 0Fh |
| Memory Bank1 Bank 01 | EPC Area 128bit | 70h | EPC [15 : 0] | | 7Fh |
| | | 60h | EPC [31 : 16] | | 6Fh |
| | | 50h | EPC [47 : 32] | | 5Fh |
| | | 40h | EPC [63 : 48] | | 4Fh |
| | | 30h | EPC [79 : 64] | | 3Fh |
| | | 20h | EPC [95 : 80] | | 2Fh |
| | | 10h | PC(Protocol Control) | | 1Fh |
| | | 00h | CRC-16 | | 0Fh |
| Memory Bank0 Bank 00 | Password & Reserved Area 80bit | 40h | (See Note 1) | | 4Fh |
| | | 30h | ACCESS Password [15 : 0] | | 3Fh |
| | | 20h | ACCESS Password [31 : 16] | | 2Fh |
| | | 10h | KILL Password [15 : 0] | | 1Fh |
| | | 00h | KILL Password [31 : 16] | | 0Fh |

Note 1 : 40h to 4Fh

| 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 4A | 4B | 4C | 4D | 4E | 4F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lock Bits | | | | | | | | | | | | FACTORY SETTINGS | | | |

Note 2 : Data Pointer and Data length in the Data Read(RDDT)/Data Write(WTDT) command format should be specified by Decimal Number in each WORD(16bits) unit.

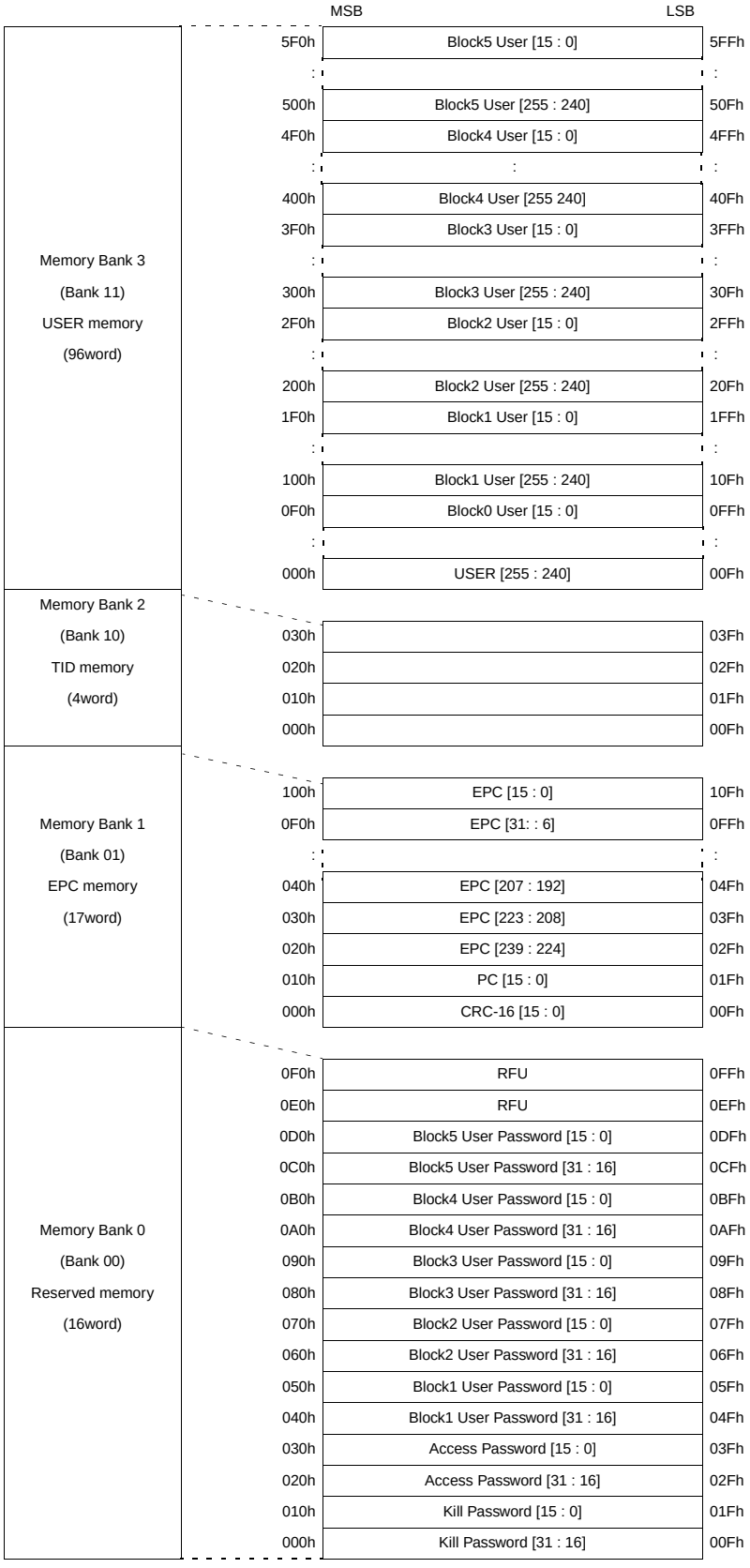
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | EPC [ 15 : 0 ] | | | | | | | | | | | | | | | |
| 6 | EPC [ 31 : 16 ] | | | | | | | | | | | | | | | |
| 5 | EPC [ 47 : 32 ] | | | | | | | | | | | | | | | |
| 4 | EPC [ 63 : 48 ] | | | | | | | | | | | | | | | |
| 3 | EPC [ 79 : 64 ] | | | | | | | | | | | | | | | |
| 2 | EPC [ 95 : 80 ] | | | | | | | | | | | | | | | |
| 1 | PC ( Protocol Control ) | | | | | | | | | | | | | | | |
| 0 | CRC-16 | | | | | | | | | | | | | | | |

Data Pointer

In case data reading 32bits(2WORD) data on EPC[95 to 64bits] in the above me
RDDT 1 2 2 Memory Bank 1, Data Pointa 2, Data length 2

# Memory Map of the Secure Tag

Following table shows the memory map of the secure tag (μ-HIBIKI Ver1.34).



| | | MSB | | LSB |
|---|---|---|---|---|
| Memory Bank 3 (Bank 11) USER memory (96word) | | | | |
| | 5F0h | Block5 User [15 : 0] | | 5FFh |
| | : | | | : |
| | 500h | Block5 User [255 : 240] | | 50Fh |
| | 4F0h | Block4 User [15 : 0] | | 4FFh |
| | : | : | | : |
| | 400h | Block4 User [255 240] | | 40Fh |
| | 3F0h | Block3 User [15 : 0] | | 3FFh |
| | : | | | : |
| | 300h | Block3 User [255 : 240] | | 30Fh |
| | 2F0h | Block2 User [15 : 0] | | 2FFh |
| | : | | | : |
| | 200h | Block2 User [255 : 240] | | 20Fh |
| | 1F0h | Block1 User [15 : 0] | | 1FFh |
| | : | | | : |
| | 100h | Block1 User [255 : 240] | | 10Fh |
| | 0F0h | Block0 User [15 : 0] | | 0FFh |
| | : | | | : |
| | 000h | USER [255 : 240] | | 00Fh |
| Memory Bank 2 (Bank 10) TID memory (4word) | | | | |
| | 030h | | | 03Fh |
| | 020h | | | 02Fh |
| | 010h | | | 01Fh |
| | 000h | | | 00Fh |
| Memory Bank 1 (Bank 01) EPC memory (17word) | | | | |
| | 100h | EPC [15 : 0] | | 10Fh |
| | 0F0h | EPC [31: : 6] | | 0FFh |
| | : | | | : |
| | 040h | EPC [207 : 192] | | 04Fh |
| | 030h | EPC [223 : 208] | | 03Fh |
| | 020h | EPC [239 : 224] | | 02Fh |
| | 010h | PC [15 : 0] | | 01Fh |
| | 000h | CRC-16 [15 : 0] | | 00Fh |
| Memory Bank 0 (Bank 00) Reserved memory (16word) | | | | |
| | 0F0h | RFU | | 0FFh |
| | 0E0h | RFU | | 0EFh |
| | 0D0h | Block5 User Password [15 : 0] | | 0DFh |
| | 0C0h | Block5 User Password [31 : 16] | | 0CFh |
| | 0B0h | Block4 User Password [15 : 0] | | 0BFh |
| | 0A0h | Block4 User Password [31 : 16] | | 0AFh |
| | 090h | Block3 User Password [15 : 0] | | 09Fh |
| | 080h | Block3 User Password [31 : 16] | | 08Fh |
| | 070h | Block2 User Password [15 : 0] | | 07Fh |
| | 060h | Block2 User Password [31 : 16] | | 06Fh |
| | 050h | Block1 User Password [15 : 0] | | 05Fh |
| | 040h | Block1 User Password [31 : 16] | | 04Fh |
| | 030h | Access Password [15 : 0] | | 03Fh |
| | 020h | Access Password [31 : 16] | | 02Fh |
| | 010h | Kill Password [15 : 0] | | 01Fh |
| | 000h | Kill Password [31 : 16] | | 00Fh |

# SECTION 3
# Mode and Function


| | |
|---|---|
| Mode | 36 |
| Function | 37 |

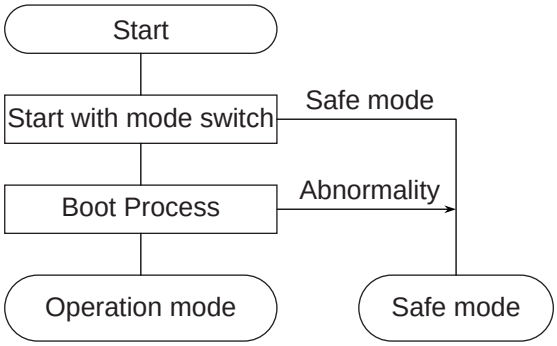
# Mode

## Reader Operating Mode

Reader operating mode contains three modes, Operation Mode, Safe Mode and Update Mode.
If you push the Mode Switch for 1 second or more and release the switch while the system is running, or if the reader detects an error (ex. System error or a failure of firmware update), and it can not start up normally due to this error, the reader will start up under Safe Mode. Under this mode, you can check the status via Web browser, initialize the setting and install the firmware.

CHECK! Refer to the *Ethernet Interface* and *RS-232C Interface*in detail.

*p. 55*




## Communication Mode

The communication mode can be selected according to changing communication speed with RF tag such as high-speed communication or reducing speed to get more reliably communcation. The communication mode can be specified by comunication setting parameter (SETC).
When the communiction mode is set to MODE 0, it represents AUTO MODE that the reader automtically change the communication speed according to the environmental interferences level.
When using MODE 2 which provides the highest communication speed, intereferences between several readers will be increased, and cause to deteriorate the read performance.

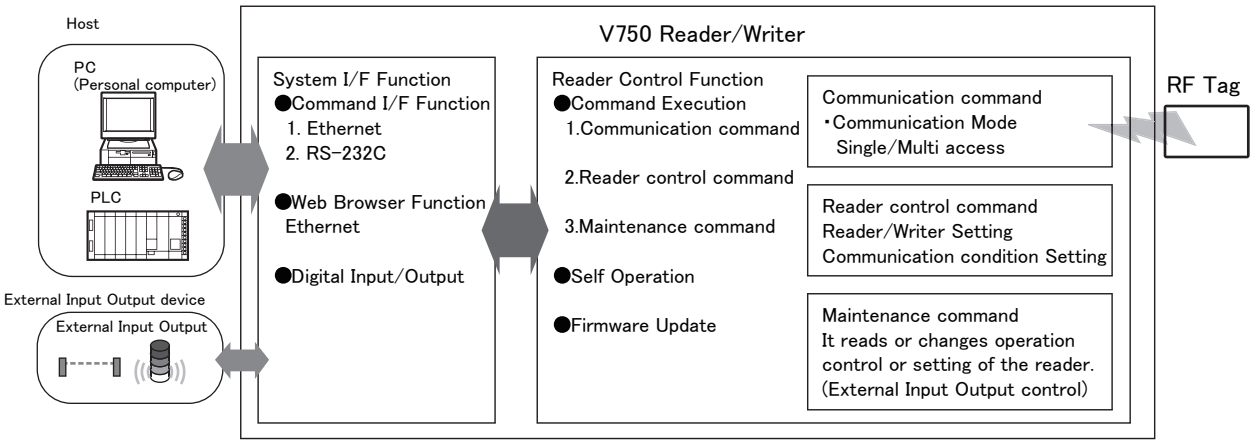
| | | Mode 0 | Mode 1 | Mode 2 |
|---|---|---|---|---|
| Communication speed | RF Tag → Reader/Writer | Auto | 40kbps | 160kbps |
| | Reader/Writer → RF Tag | 40kbps | | |

Note: MODE 0 is default setting.

CHECK!
- MODE 0 is default setting.
- Please test prior to operation to check the influences on interferences with several readers if you change the communication speed fast.

# Function

The reader consists of there parts of function, System I/F function for communication with host system or controlling general input and output from external devices, control the reader device, and control the communication with RF tag. As a function of controlling the reader device, it includes Command execution, Self-execution, firmware update.

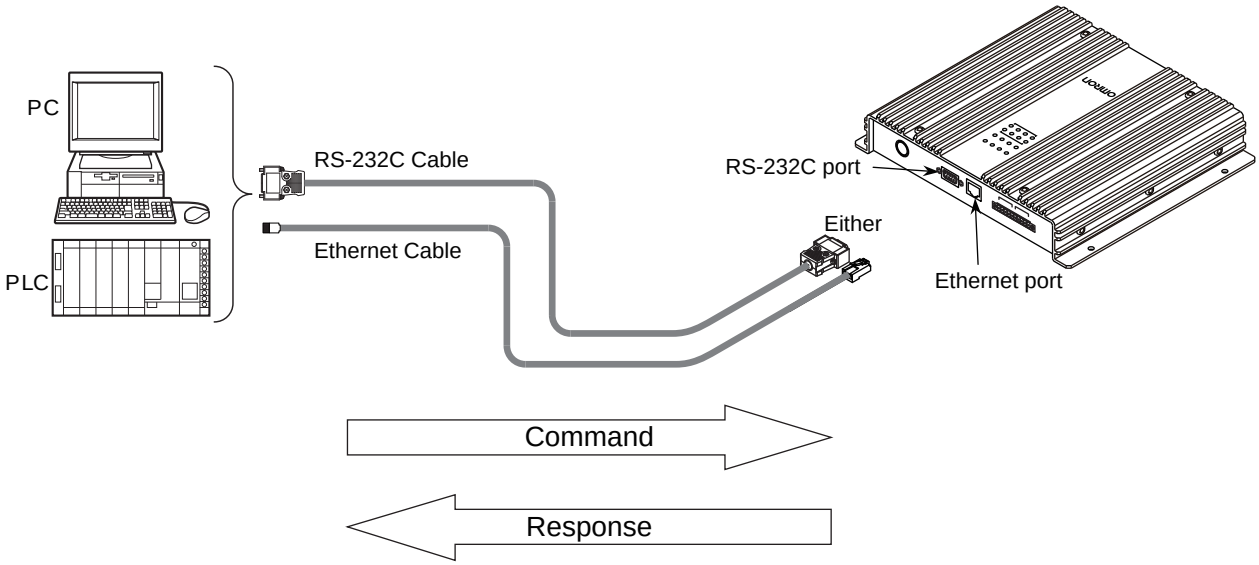



## System I/F Function

The System I/F provides the command I/F for communication with host system and web browser I/F. It also provides digital input/output I/F for controlling external input and output devices.

### ■ Command I/F Function

Via 10/100BaseT Ethernet or RS-232C, the host issues a command to control the reader. As the control method, V750 supports original procedures. Same commands are used via Ethernet and RS-232C.



## • Ethernet

Ethernet is connected with the host such as server computer via TCP/IP protocol.
IP address corresponds to dynamic IP address assigned by DHCP server. You can choose the static IP address (Default 192.168.1.200) or a dynamic IP address. Default setting is static IP address. The port 7090 is used by reader for communication. IP address and the port number (over 1024) can be changed by using a setting command or Web page. If the reader can not detect the DHCP server under dynamic IP address setting, it will flash the error indicator and start up with static IP address.

## • RS-232C

To connect to the PC or PLC(Programmable Logic Controller) which equipped RS-232C serial communiction I/F.
Following communication setting for RS-232C are supported.

Opptional communication conditions

| Item | Setting value | Factory-default |
|---|---|---|
| Baud rate | 9,600 bps, 19,200 bps, 38,400 bps, 57,600 bps | 57,600 bps |
| Data length | 7/8 bits | 7 bit |
| Parity | Even/Odd/None | Even |
| Stop bit | 1/2 bit | 2 bit |

## ■ Web Browser Function

All the reader function can be accessed thorough the web browser which is installded on the standard PC. It can open the operation windows by inputting the address http;//192.168.1.200(default). If you are setting individual IP address for each readers, you need to input its IP address. The Java software required to control the web browser I/F.

CHECK! Refer to the *Browser-Based Interface* for details.

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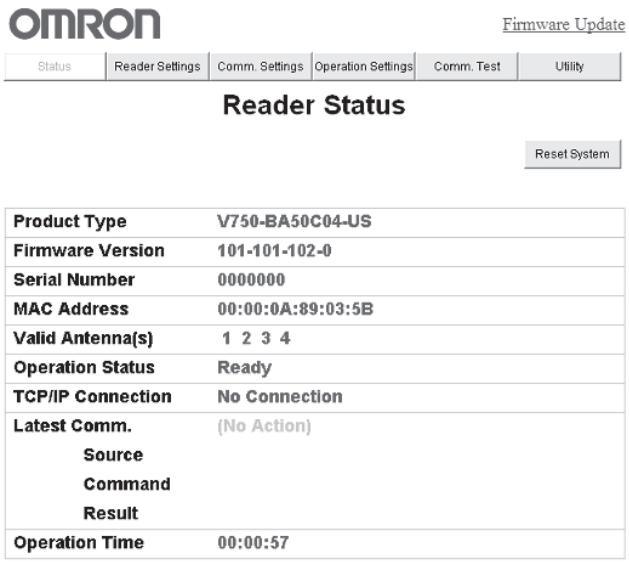



| Item | | Function |
|---|---|---|
| Web Browser | | Via Web browser, you can set following functions, which can perform various works such as indicating an operation status or setting condition, or setting an operation parameter. |
| | 1.Reader Status | Indicates current setting and operation status |
| | 2.Reader Settings | Specifies a parameter for communication with host. |
| | 3.Communication Settings | Specifies a parameter for communication with tag. |
| | 4.Operation Settings | Specifies a command entry and programmable output conditions. |
| | 5.Communication Test | Executes a communication commands |
| | 6.Utility | Provides some functions for easy installation and maintenance.<br>- Latest Error Logging (The function to display the latest error log)<br>- History of Error Logging (The function to display the counted error log)<br>- Noise Check (The function to monitor an on-site environment)<br>- Option Information (The function to display the information of available options) |
| | 7.Firmware Update | Provides the method to update. |

Note: You can download Java software via following URL.

**http://www.java.com/ja/**

Java(TM) is trademark of Sun Microsystems.

## ■ Digital Input/Output

### • Digital input

Following two functions can be assigned to 4 digital inputs respectively. To assign the function, set via Set Operation window of command or Web.

1. User Input :reads ON/OFF state by receiving the command from the host.
2. Command entry :executes registered command series at the rising edge of input signal.

### • Digital output "Programmable output"

Following three functions can be assigned to 4 digital outputs respectively. To assign the function, set via Set Operation window of command or Web.

1. User output: outputs ON/OFF state according to the command from the host.
2. Reader state output: outputs operation status of the reader.
   Communication results output:outputs ON/OFF signal depending on the specified judgment after communication process.

Refer to the *Self-Operation* for details.

*p. 42*

# Reader control function

The function of control the reader device provides the interpretation of the command from the system I/F to tag communication control, and vice versa.

## ■ Command Execution

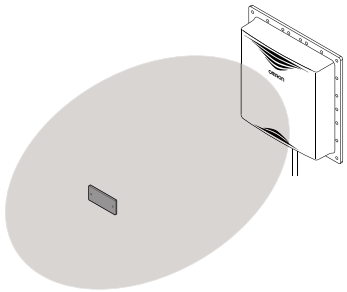
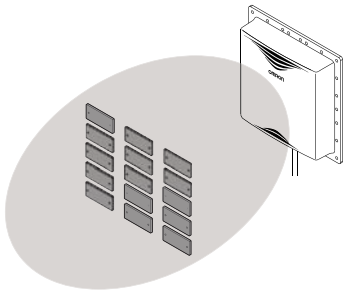
Receiving a command from the host via Ethernet or RS-232C, the reader starts the command execution and return its response(result) to the host. You can use following commands.

CHECK! Refer to the *Command Line Interface* for details.

*p. 59*

### • Communication command

The command is used to communicate with RF tag. In the commmunication command, you can specified the communication parameter for single access mode which communicates with just single RF tag in the field and for multi access mode which communicates with multiple RF tag in the field. You can also specified anntenna to be used and communiction duration as a communication parameters.

| Mode | Single Access Mode | | Multi Access Mode | |
|---|---|---|---|---|
| RF Tag in the Communication field |  | |  | |
| Repeat | Once | Repeat | Once | Repeat |
| parameter | SOC<br>Single Once | SRP<br>Single Repeat | MOC<br>Multi Once | MRP<br>Multi Repeat |

### • Reader control command

The command is used to set the pramater of the reader device or communiction settings for the communication with RF tag. As a setting of commmuniction with RF tag, it includes the filtering setting which provides communiction with specific RF tag according to the filtering settings.

### • Maintenance command

The command is used to control the reader opration. It includes the reader setting initilatization, terminating command execution, and control the input/output port for controlling the external devices.

## ■ Self-Operation

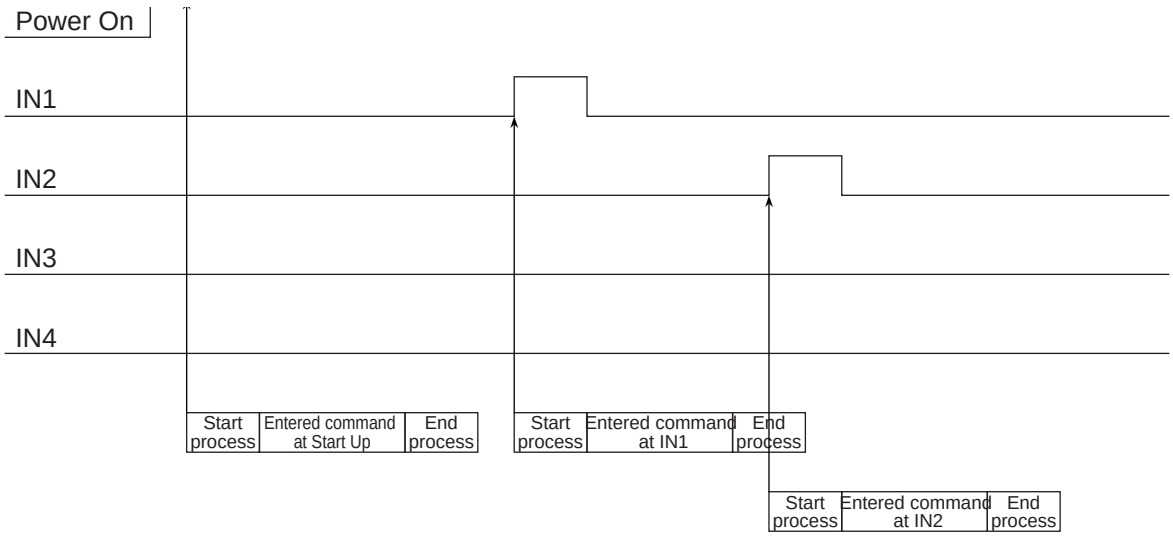
The self-execution function provides the stand-alone solution to read RF tag and control the external output according to the result of reading tags without host controller. The registered command can be issued by triggerring external input such as sensors. The result of communiction or reader status can be outputted to external ouput.

### • Command entry

The execution timing of the command is at in each execting timing. It can be registered either from command I/F or web brower I/F. The registered command is stored in the non-volatile memory in the read and it enables at next boot-up or reset. ( The ON/OFF status of IN1 to IN4 can be read from the host by issuing EXIO command.)



| Item | Executing timing | Entered command |
|---|---|---|
| Power On | Power up or TCP/IP connection | Any given command |
| IN1 | The rising edge of input #1 signal. | |
| IN2 | The rising edge of input #2 signal. | |
| IN3 | The rising edge of input #3 signal. | |
| IN4 | The rising edge of input #4 signal. | |




The reader executes the IN2 registered command during command execution.
It shows Error if you execute the command which is not permitted during execution.

If you registered the command which execute at boot timing, it can be configure the simple self instruction system without host communication system or can be possible to self checking functionality for the system at the system boot.

CHECK!

Do not registered the Reset Command during powering-up. It causes failure of boot up of the reader.

### • Programmable output

The programmmable output can output the reader operation status such as normal or error results, or judgement results based on comparison the response from the RF tag data.
It can use from both command I/F or web browzer I/F.

Available conditions

| Function | Output timing | Note |
|---|---|---|
| RUN | Running Normally | Same action as RUN LED (except for blink). |
| ERR | Abnormally stopped | Same action as ERR LED (except for blink). |
| COM | Communication status | Same action as OR of AT1-4 LED. |
| ATn (n:1 to 4) | Antenna "n" is specified. | Same action as LED of AT1, AT2, AT3, and AT4. |

The judgement results output to output port(OUT1 to OUT4) according to the judgement criteria which registered in the reader at the timing when the RF tag is responeded. It can be specified two judgment criteria and output duration for each output. In case of no judgement criteria setting, it alwasy output.

Available conditions

| Function | Output timing | Condition setting | Option |
|---|---|---|---|
| NORMAL | The process is finished normally. | -The read/written tag count:<br>Operator (>=, <=, ==, !=)<br>Compared number<br>-Data comparison: Operator (==, !=)<br>Compared data | Output duration |
| ERROR | The process is finished abnormally. | Error code | Output duration |

CHECK! Refer to the *Command Line Interface* and *Browser-Based Interface* for details of a Setting method.

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## ■ Firmware Update

You can update the firmware by specifying update files via Web browser. Updated data shall be effective upon subsequent powering-up. If the firmware update is failed with some reasons and the reader could not boot-up correctly, you can recover the reader by boot-up with Safe-mode.

CHECK! Do not power down the reader during firware update. It cause of failure to boot the reader.

## ■ EPC Word Length

The function of setting EPC owrd length can be set by specifying the option "EWL" in the communication setting command(SETC). It can also be read by the command(GETC) with the option "EWL".

CHECK!

The EPC word length can be set/get thorugh the"*Communication condition Settings*" window in the "*Comminction condition setting*" described at the *SECTION 6*

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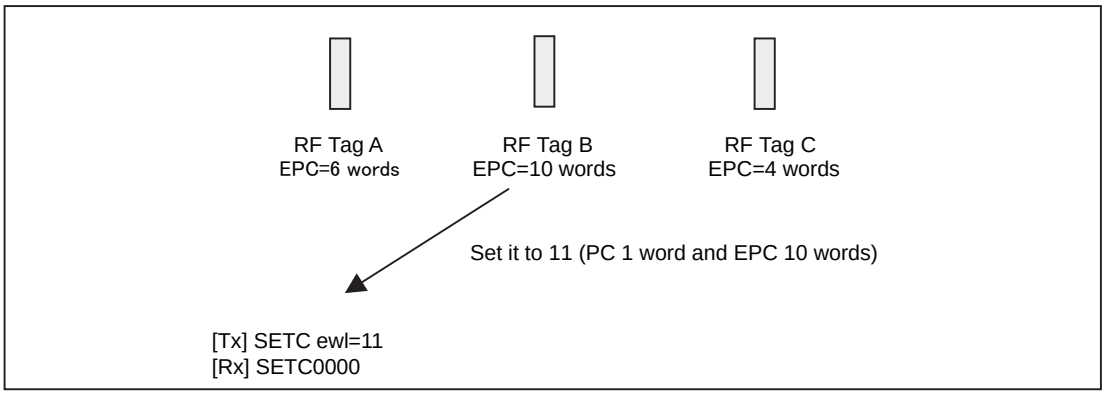
The length shall be set with "0" as an auto mode or a number from 1 to 32 as fixed length mode. Default value is "0" (auto mode).
For fixed length mode, set a total number of tag's PC length (constantly 1) and EPC word length.

| Value | Description |
|---|---|
| 0(auto mode) | R/W measures the EPC word length of the tag automatically and sets the most suitable value. Generally, use this mode. |
| 1 to 32(fixed length mode) | R/W communicates with the tag depending on the set value. If you have a word length of the tag to be read before hand, use this mode.The value must be the greatest of the EPC word lengths of the tags to be read. |

Ex1) When EPC word length of a communicating tag is unknown set EPC word length to "0" (auto mode).
[Tx] SETC ewl=0
[Rx] SETC0000

Ex2) When EPC word length of a communicating tag is known beforehand, set the word length.
For example, set it as follows when all EPC length of a communicating tag are 96bit (6 words).
[Tx] SETC ewl=7
[Rx] SETC0000

If the number of tags to be read is two or more and each tag has different EPC length, set the greatest number of the EPC word lengths of them.




[Note] If you set the smaller value than the actual EPC word length, communication precision may be decreased.

[Note] This function is available in firmware version 102-102-103-0 or later

## ■ Receiving Level Detection

It can get the receiving signal strength from the RF tag (dBm unit, 0.125dBm step) by specifying the option "LVL" in the "-tif" paraemeter on the ID read command.
In the UHF RFID system, the communication range varies by the influences of materials and condition of which RF tag attached and orientation of RF tag and type of RF tags etc. This function can be useful to measure these influnces on RF tag.

This graph of the communiction diagram in the *Reference data* at *SECTION 8* shows the the receiving signal strength vs distance between antenna and RF tag for the reference.

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Note that if the reader can communicate multiple times at one command, it returns the first receiving signal strength value.

[Note] This function is available in firmware version 102-102-103-0 or later.

Please use these values which getting LVL option and its reference graph as a relative reaference only. It can not gurantte the absorte value due the value may vary in variious condition such as RF tag used and sourrneded environment.

## Session Setting

The session flag which described in the EPC Global Class 1 Generation 2 air interface standard indicates the duration of keeping power-on after the RF tag chip is shutted down such as it comes out from the antenna field.

It recommends to use as default settings in normal operation.

The default settings of the session flag are follows.

S0 for communication sequence specified once access ( SOC, MOC)

S2 for communication sequence specified repeat access ( SRP,MRP)

It can be settable based on the requirements of system operation.

| Communication option | Flag | Description |
|---|---|---|
| Once Access Mode<br>- Single Once<br>- Multi Once | S0 | Factory default setting.<br>In this setting, the reader communicates with all tags existing in the communication field whenever a command is executed. |
| | S1/S2/S3 | In this setting, the reader communicates with un-read tags (it ignores once-read tags.)<br>If S1 is set, tag refreshes its S1 flag when a specified time has passed after flag setting (after communication transaction) regardless of whether tag energized or not. It means that the tags are read repeatedly in a certain interval.<br>If S2 or S3 is set, tag refreshes its S2 or S3 flag when a specified time has passed after tag energizing stopped. It means that the tag is not re-read unless the tag stays out of the communication field for the specified time. |
| Repeat Access Mode<br>- Single Repeat<br>- Multi Repeat | S2 | Factory default setting.<br>In this setting, the reader communicates with new-detected tags existing in the communication field during the command execution. |
| | S0 | When there is a tag the reader can not read because of flag conflict with other readers, this setting enables the reader to read the tag. |
| | S1/S3 | If another reader set in the previous process line uses S2 flag, the reader same flag may encounter the flag conflict. S1 and S3 flags are used to avoid this conflict. Setting S3 provides same operation as S2 setting. If S1 is set, tag refreshes its S1 flag when a specified time has passed after flag setting (after communication transaction) regardless of whether tag energized or not. It means that the tags are read repeatedly in a certain interval. |

*1 : The read rate may drop when the session flag is set to S0 for the communiction seqeunce with repeat(SRP/MRP), due the reader communcates with several times with the same RF tag and it increase the communiction time. Also it may cause the reader halt error(system setting error) due to the increase the data trafic on the communiction I/F on Ethernet or RS-232C.

| Flag | Effect of each session flag |
|---|---|
| S0 | None |
| S1 | 500ms to 5000ms (Same when tag is energized) |
| S2/S3 | 2000ms or more |

[Reference : Class1 Generation2 UHF RFID Protocol for Communictions Version 1.1.0]

* SL flag which can be specified independetly with S0 to S3 is used for filtering function.

## LBT(listen Before talk)

In the Japanese radio regulation, it needs to check the available channels before it outputs the radio (LBT : Listen Before Talk) due to its limited channl usage.

LBT requirements (for high output)

| | |
|---|---|
| Carrier sense level | : -74 dBm/channel |
| Carrier sense time | : above 5msec |
| transmitting duration | : transimit below 4msec, wait least 50msec. |

It can select the transmitting channel either all channels or only specfied channels with LBT control. The default setting is set to all channels (1 to 9 channel ) . It can also specify 1,3,5 channels for example.
If you select only one channel and this channel is not available during timout period of the command, the reader returns the communication error ( code 7000 : channel are not available).

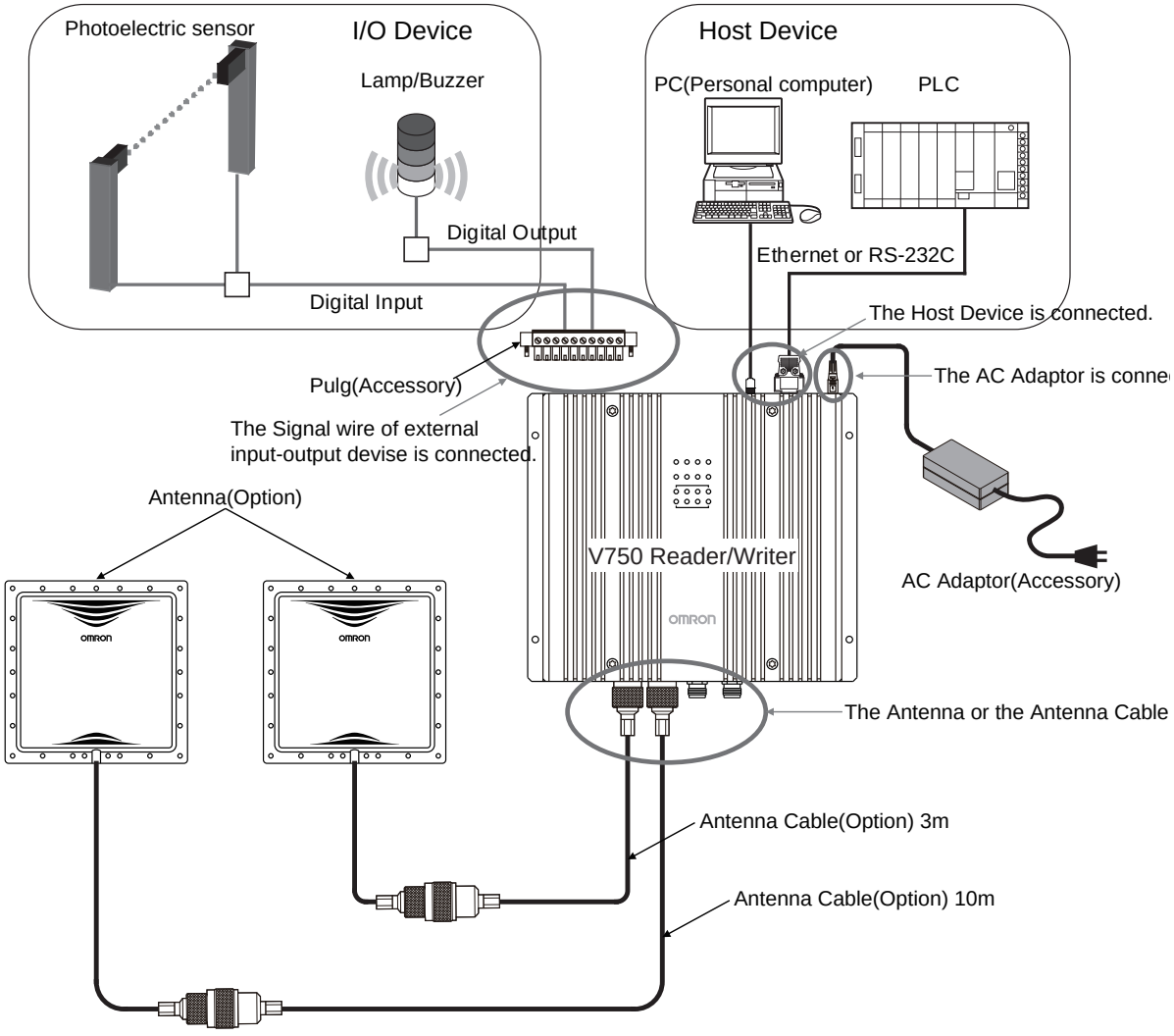
MEMO

# SECTION 4
# Diagnosis and Maintenance


| | |
|---|---|
| Connection of Reader and each equipment | 50 |
| Reader/Writer Setting | 51 |
| Installation Environment | 52 |
| Installation and Wiring | 53 |
| Wiring for cable | 55 |

# Connection of Reader and each equipment

The reader needs to be connected to antennas and host controller such as PC and PLC to operate as system. Also when it operates by external Input/Output devices,  it needs to be wiring to those device to enable exchange control signals. This chapter decribes how to connect for those external devices.




## ■ Confirmed item

Please confirm the following items before supplying the AC power supply of the AC adaptor.

| No. | Confirmed item | Confirmed content |
|---|---|---|
| 1 | Connection of Antenna | Make sure the connection between antenna cable and antenna, and also antenna cable and the reader antenna port. |
| 2 | Connection with host device | Make sure the connection to the Ethernet or RS-232C port. |
| 3 | Connection of Signal wire of external input-output device | Make sure wiring from the external devices to the terminal at the reader are securly tighten. |
| 4 | Conection of DC Jack of AC adaptor | Make sure the DC jack connected to AC adapter securely. |

CHECK!

Pleaese check all accessories are are included when you open the box at first.

# Reader/Writer Setting

## Ethernet Setting

When you connect the reader via Ethernet I/F, the default setting of the reader are shown as below. Please check the setting of Ethernet at host system when you connect.

| Item | Factory-default |
|---|---|
| IP Address | 192.168.1.200 |
| Subnet Mask | 255.255.255.0 |
| Gatewey | 192.168.1.254 |
| Communication Port | 7090 |

## RS-232C Setting

When you connect the reader via RS-232C I/F, please check the communication setting for both the host system and the reader.

| Item | Setting value | Factory-default |
|---|---|---|
| Baud Rate | 9,600/19,200/38,400/57,600 bps | 57,600 bps |
| Data Length | 7/8 bit | 7 bit |
| Parity Bit | Even/Odd/None | Even |
| Stop Bit | 1/2 bit | 2 bit |

## Initialization of setting

It can return to default setting by sending initialize command(INT).

CHECK! When you issue the command, refer to "*Command Line Interface*" in the *SECTION 5*.

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# Installation Environment

Since the protection grade for the reader is IP50 and the standard antennas is IP53(IEC60529), it can be installed only indoor environment within the protection grade. It needs to be refer to following instructions to get the system reliability and the system performance.

## Location

Do not use the Product in the following locations.

- Locations not within the specified operating temperature range (Reader/Writer: -10 to 50°C, Antenna: -15 to 60°C, RF Tag: -10 to 55°C).
- Locations not within the specified operating humidity range (25% to 85%).
- Locations exposed to any flammable gasses, corrosive gasses, dust, metallic powder, or salts
- Locations subject to direct vibration or shock outside the specified ranges
- Locations where the reader is exposed to direct sunlight. (Reader/Writer, Normal type Antennas)
- Locations subject to spray of water, oil, or chemicals (Reader/Writer, Normal type Antennas)
  Locations subject to oil, or chemicals (Waterproof type Antennas)
- Locations nearby high-temperature devices such as heater, transformer, high wattage resistor.
- Locations near by power line ( line for deliver large current such as motor cable). If it needs to locate the reader proximitry to power line, please conduct testing to reduce the influences of electric nois.
- Outdoor (Reader/Writer, Normal type Antennas)

When two or more Reader/Writers are set up, the influence of the interference of the Reader/Writer is tested enough beforehand and it confirms it.

The communication between RF tag and the reader may vary according to the environment condition. Please test prior to the operation.

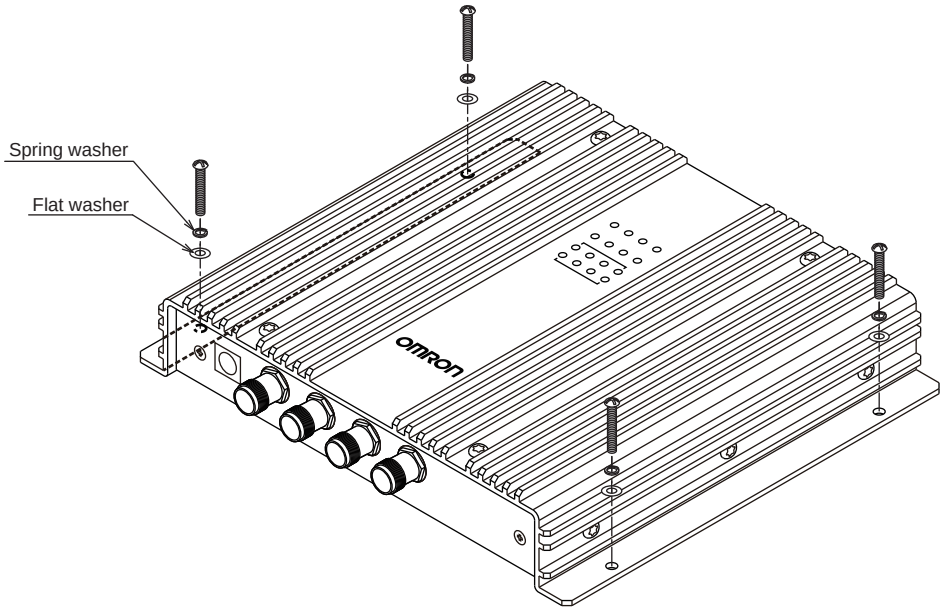
- For the installation, follow the instruction below and conduct enough testing.
- Antenna cables should not gather together with other cables, and only specific antenna cable(Model V740-A01 3M/ 10M/20M) can be used.
- Power cables and I/O cables should not gather together with other cables as much as possible.
- If the anntena and antenna cable expose to drops of water, use water-proof tape at the antenna connector.
- Do not remove the metal fittings attached with the water-proof antennas. It may cause the deteroration of performance of water-proof.

# Installation and Wiring

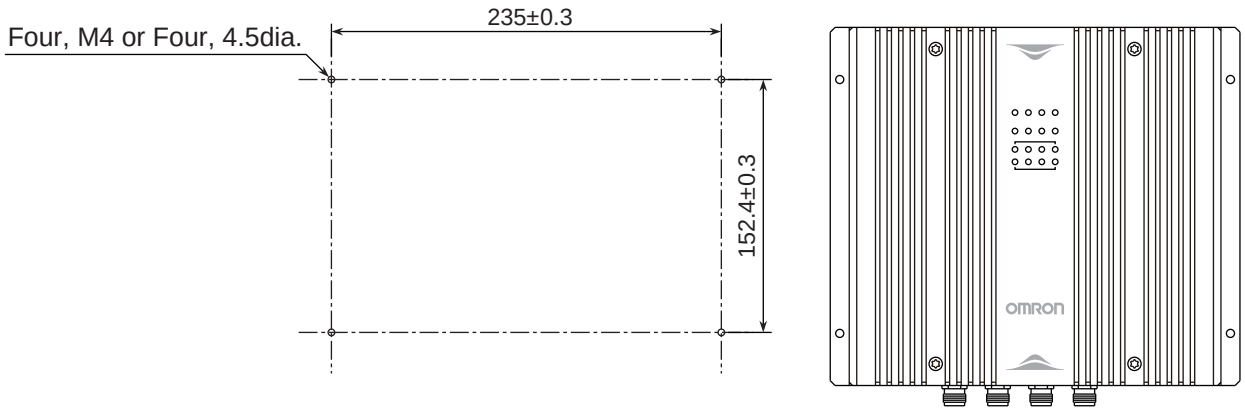
Fix the reader and antennas rigidly by using its mounting hole which mounting schematics shown below.
Use M4 screws with spring washer and flat washer for mounting the reader.
Use M6 screws with spring washer and flat washer for mounting antennas.
Use M3 screws with spring washer and flat washer for mounting RF tag.
Do not use the organic solvent such as screw lock tight after tighten the screws. It may cause the damage to the mouting panels.

## Mounting Hole Dimensions

### ■ Reader/Writer(V750-BA50C04-US)




Mounting Hole Dimensions

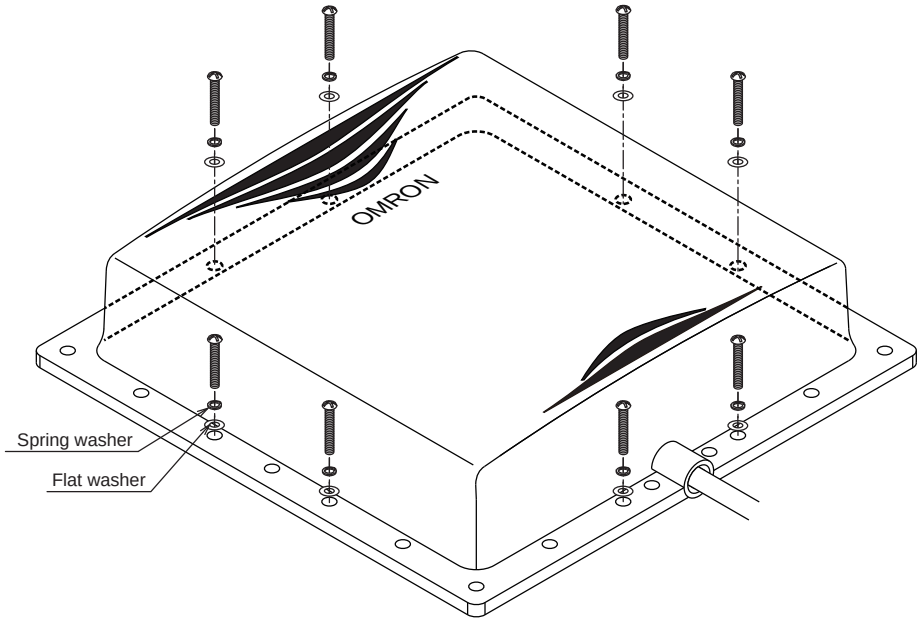



(Unit : mm)

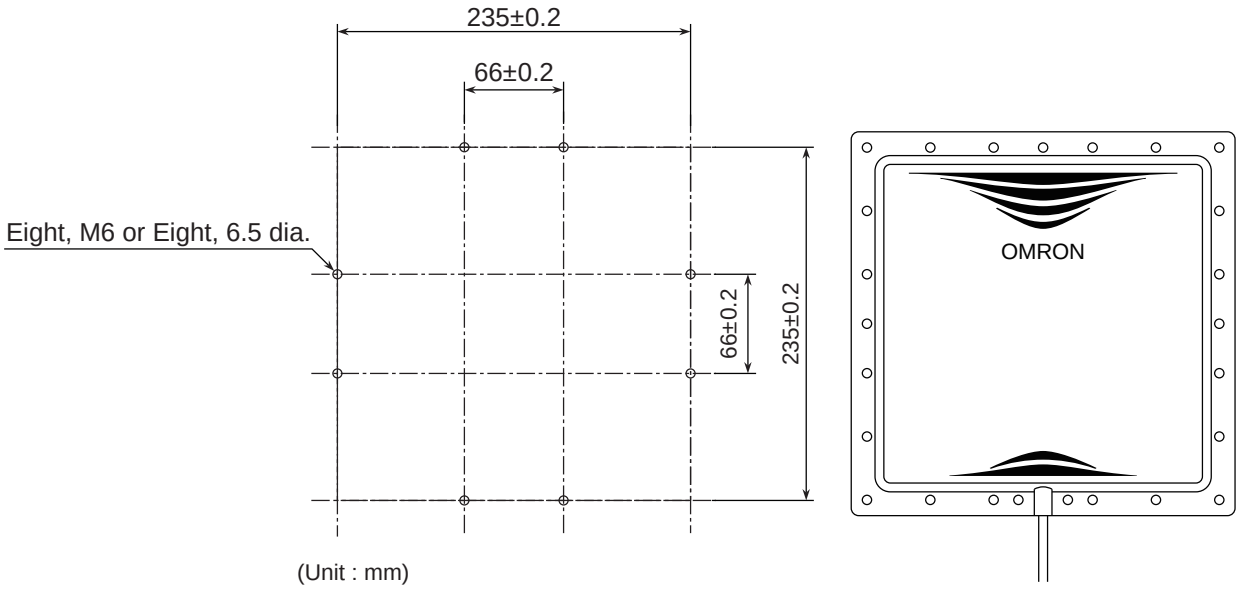
CHECK!

Tighten the screw with the torque 1.2N•m for moutning.

## ■ Normal type Antennas(V740-HS01CA / V740-HS01LA)




Mounting Hole Dimension




(Unit : mm)

CHECK!

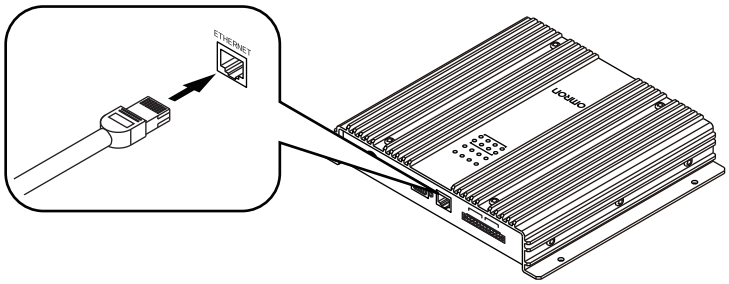
Tighten the screw with the torque 2N•m for moutning.

# Wiring for cable

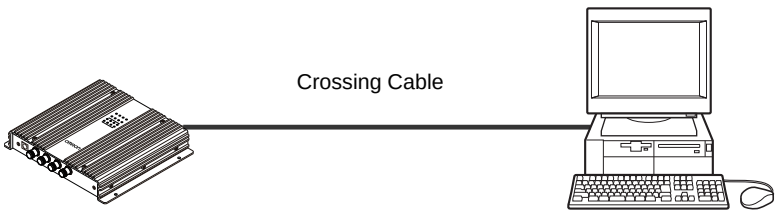
## Connection with Host Device

### ■ Ethernet Interface

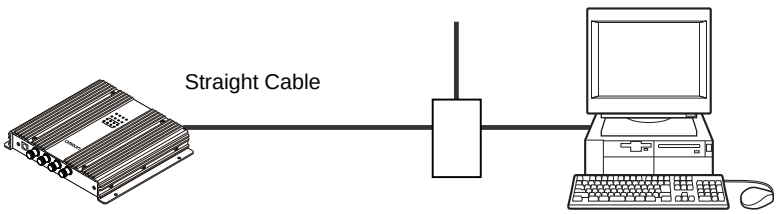
The cable is inserted and connected with the Ethernet port connector of the Reader/Writer.




**• When connecting it directly with PC**




**• When connecting it with PC by using the HUB and the Router**

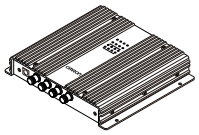



CHECK!

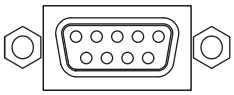
- Use sheiled Ethernet cable.
- For the cable length, use the cables which are available in the market

## ■ RS-232C Interface

**• Connecting to the PC: Serial setting is set for "flow control: none".**



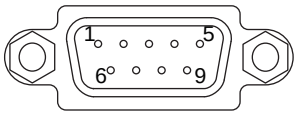
Reader/Writer
D-Sub 9 pin male (inch screw).
RS-232C



Crossing Cable

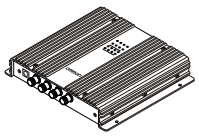
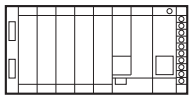
female — female

PC
D-Sub 9 pin male (inch screw).

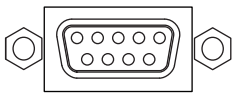



| Pin number | Signal name | Pin number | Signal name |
|---|---|---|---|
| 1 | ? | CD | 1 |
| 2 | RD | RD | 2 |
| 3 | SD | SD | 3 |
| 4 | ? | ER | 4 |
| 5 | SG | SG | 5 |
| 6 | ? | DR | 6 |
| 7 | RS | RS | 7 |
| 8 | CS | CS | 8 |
| 9 | ? | RI | 9 |

**• Connecting to the Omron's PLC (programmable logic controller): Serial setting is set for "flow control: none".**

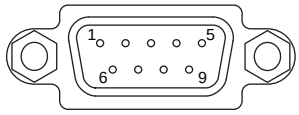
Reader/Writer
D-Sub 9 pin male (inch screw).



Special Cable

female — male

PLC
D-Sub 9 pin female (inch screw).




| Pin number | Signal name | Pin number | Signal name |
|---|---|---|---|
| 1 | --- | --- | 1 |
| 2 | RD | SD | 2 |
| 3 | SD | RD | 3 |
| 4 | --- | RS | 4 |
| 5 | SG | CS | 5 |
| 6 | --- | --- | 6 |
| 7 | RS | --- | 7 |
| 8 | CS | --- | 8 |
| 9 | --- | SG | 9 |

CHECK!

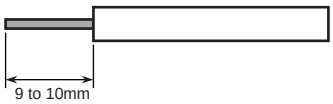
- Sheiled cable should be grounded at host system side.
- Cable length should be below 15m.

## Method of assembling Terminal stand plug for external I/O

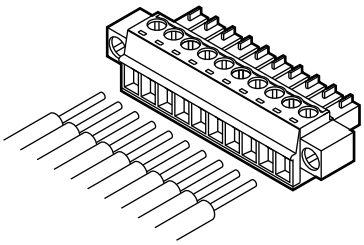
As an input/output port, the reader contains a terminal block of which connector is removable with screws.
Terminal block connector: MC 1,5/10-STF-3,81 (produced by PHOENIX CONTACT)

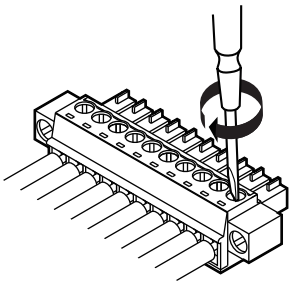
How to wire a terminal block connector with signal cables(s) and how to connect it to the reader body.

**1.** Wire a signal cable(s) to the terminal block connector. *

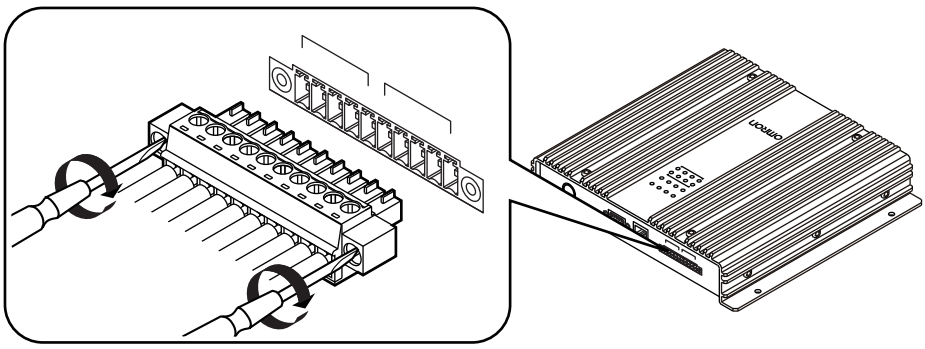



**2.** Loosen the cable fixing screw(s) (anticlockwise) and insert the signal cable(s) all the way into the connector.
Tighten the cable fixing screw(s) (clockwise).





**3.** Mount the terminal block connector to the reader body.
Fasten the terminal block connector with 2 mounting screws.



*Required Tool: Slotted driver

*** Make sure to connect the signal cable to the terminal block connector prior to mounting the connector to the body.**

CHECK!

• Check the connection of the cables correctly match each other.

MEMO

# SECTION 5
# Command Line Interface


| | |
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| Control method | 60 |
| Communication Sequence | 61 |
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| Communication command (Exclusive commands for secure tag) | 89 |
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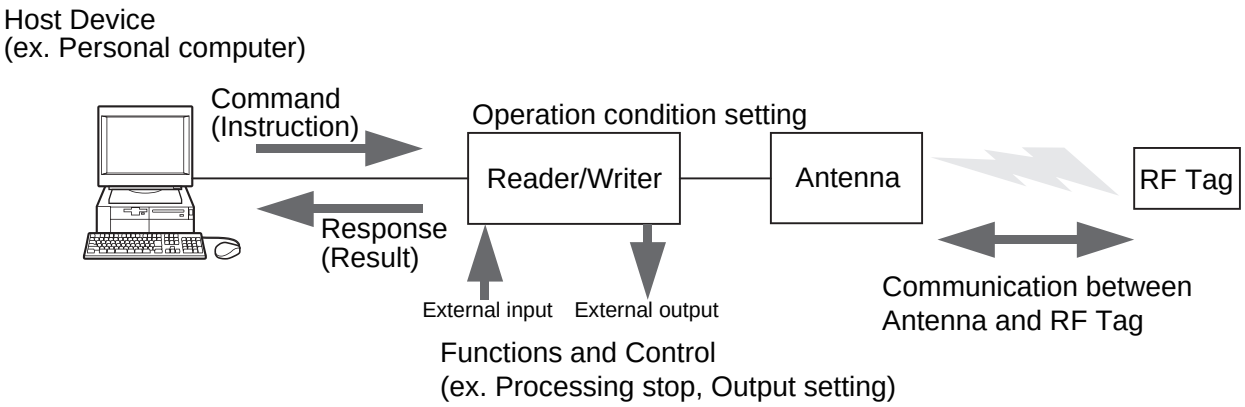
| Control Command | 119 |
| Undefined Command | 128 |

# Control method

## Control by command

The reader writer's operation is directed by transmitting the command from connected host device. It replies the result of executing the command as a response.
In the operation mode, all operation is controlled by the command according to the content of the transmitted command. (ex. Read/Write of ID of RF Tag and data, Setting of function of RF Tag, Setting of communication condition, Setting of Reader/Writer)

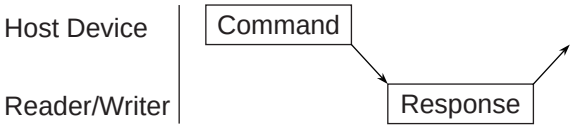



## Command and Response Flowchart

In the operation mode, the command is transmitted from host device, and it replies from Reader/Writer the response of the processing result.
There is a state of the following commands and the responses by the difference between the kind of the command and the communication specification.

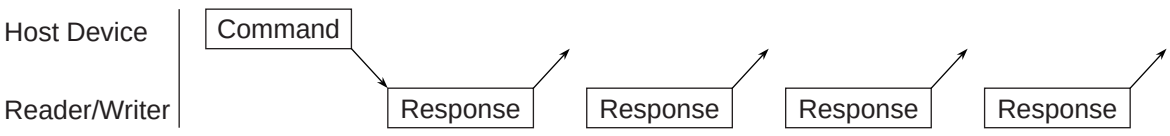
### ■ 1:1 Protocol

When Single once, Setting of communication condition, and Setting of Reader/Writer, etc. are specified by the command that communicates with the RF tag, one response is transmitted to one command.




### ■ 1:N Protocol

When Single repeat and Multi repeat, etc. are specified by the command that communicates with the RF tag, two or more responses are transmitted to one command.

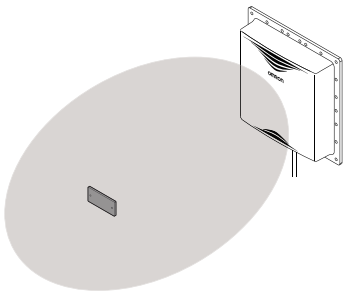


# Communication Sequence

In order to communicate with the RF Tag in the communications area of the Antenna, commands must be selected and used according to the mode and movement of the RF Tag.

## Single Access Mode

In this mode, only a single RF Tag can be in the communications area, otherwise the result of the first communication with tag replies.

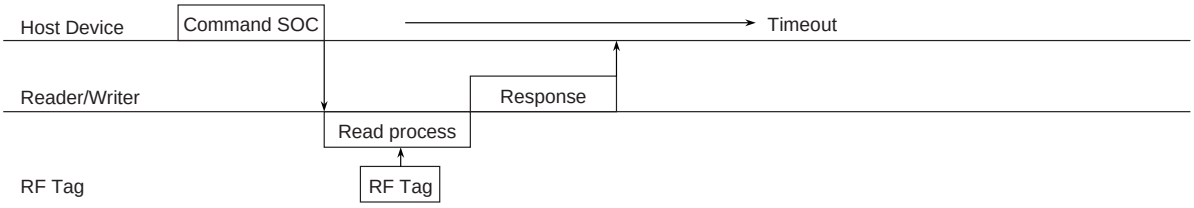


### ■ Single Once

The reader reads a single tag at a time (One-to-one communication). When the reader detects the first tag, it returns response and terminates transaction (one response/ one transaction). If the reader does not detect any tag, it continues the process for a specified period of time. In this case, the response indicates "0" as the number of tags. If the period is not specified, it continues the process until the termination command has been sent or until it detects a tag.

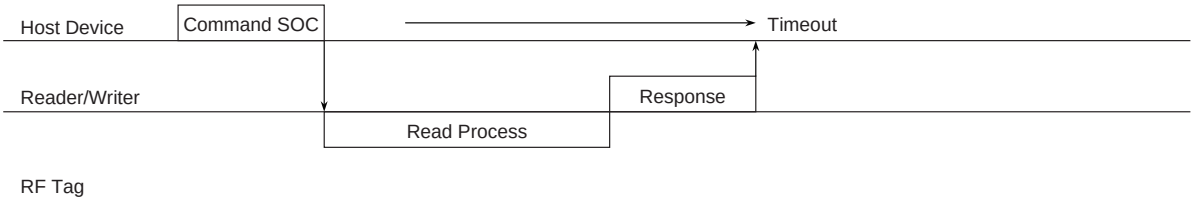
- **A sequence when the reader detects one tag for the specified period.**

Just after the reader communicates the tag, it returns a response (reporting the read tag data) to the host.



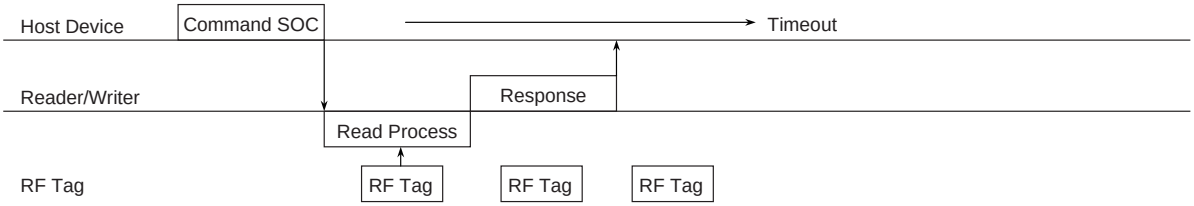

- **A sequence when the reader does not detect any tag for the specified period (There is no tag).**

At the end of the specified period, the reader returns a response (reporting "no tag") to the host.




- **A sequence when the reader detects two or more tags for the specified period**

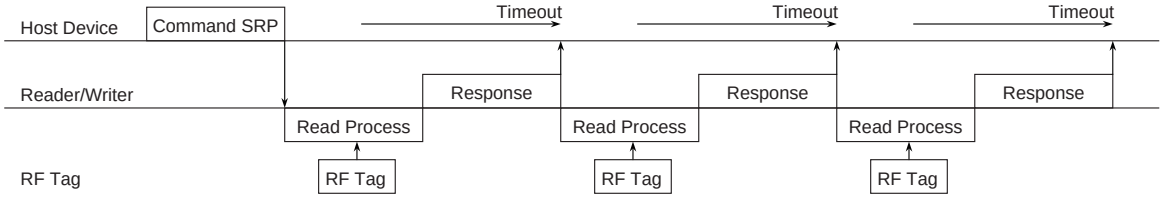
Just after the reader communicates first the tag, it returns a response (reporting the read tag data) or (reporting "no tag") to the host.



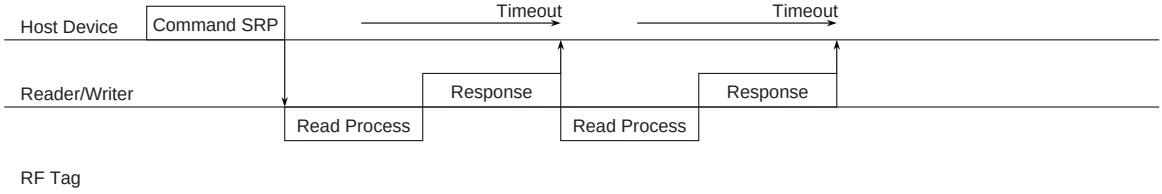
## ■ Single Repeat

The reader communicates with a single tag at a time (one-to-one communication) and repeats the communication transaction. When the reader detects the first tag, it returns response to the host, then it begins the next transaction repeatedly. Whenever it detects an unread tag, it reads the tag and returns read results to the host. It repeats the transaction until the termination command has been sent.

- **A sequence when the reader detects tags one by one as it repeats the transaction.**
  Just after the reader communicates a tag, it returns a response (reporting the read tag data) to the host.

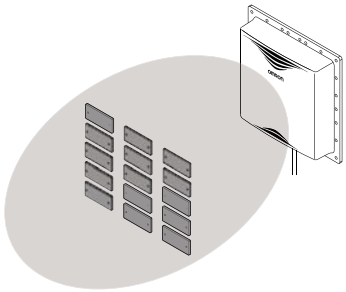



- **A sequence when the reader carries out the transaction repeatedly and there is no tag.**
  At the end of the specified period, the reader returns a response (reporting "no tag") to the host.



# Multi Access Mode

In this mode, communications with all RF Tags in the communications area can be made on receipt of the command.

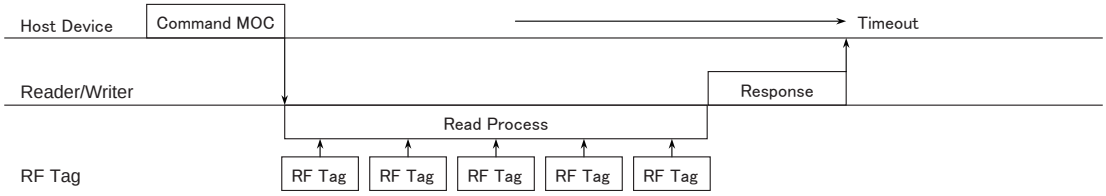


## ■ Multi Once

The reader reads multiple tags for a specified period. At the end of the specified period, it returns read results and finishes the transaction. If the reader does not detect any tag during the specified period, it returns a response meaning there is no tag.

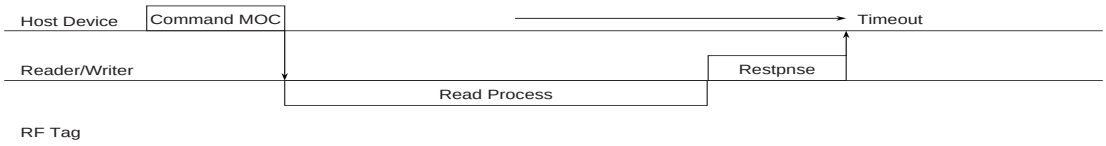
### • A sequence when the reader detects tags for the specified period.

At the end of the specified period , the reader returns a response (reporting the read tags' data) to the host.



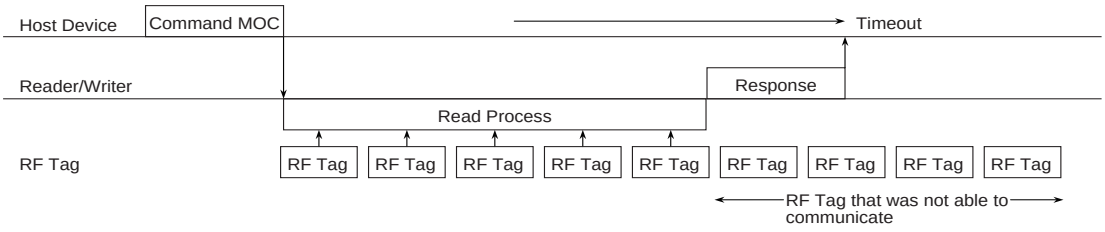

### • A sequence when the reader carries out the transaction and there is no tag.

At the end of the specified period, the reader returns a response (reporting "no tag") to the host.



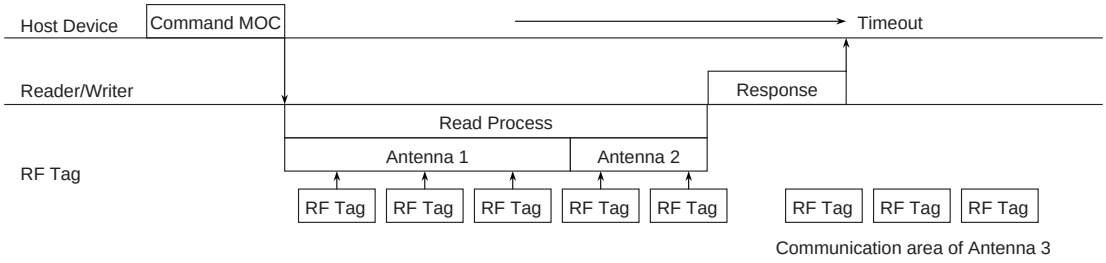

### • A sequence when the reader detects tags for the specified period. (When it is not possible to communicate with all tag. )

• At the end of the specified period , the reader returns a response (reporting the read tags' data) to the host. There is a possibility where tag that was not able to communicate exists, too.



- **A sequence when two or more reader detects tags for the specified period.**

  When it specified multiple antennas for communication with RF tags, the reader is priortized the communication with RF tags in the field within the timeout period. If the number of RF tags in the field is enough small, the reader can switch all antennas within the timeout period. If the number of RF tags in the field is large and the reader can not finish the communcation with all these RF tags during switching all antennas, the reader responds the RF tags read data at the time of time out even if it do not switch the all antennas.

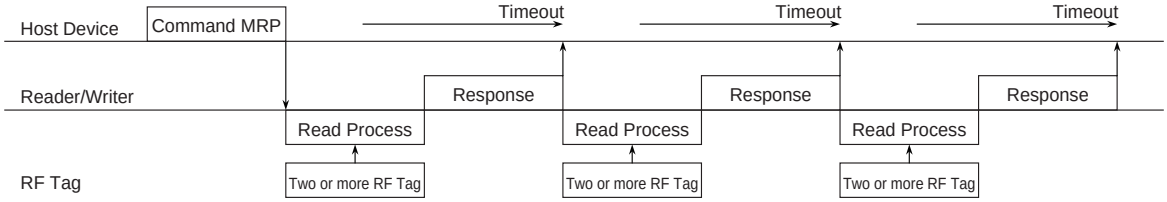


## ■ Multi Repeat

The reader reads multiple tags for a specified period. At the end of the specified period, it returns read results to the host and then it begins the next transaction until termination command has been sent. At each period, the reader returns all read tag's results to the host. If it does not read any tag during each time period, it returns response meaning there is no tag.

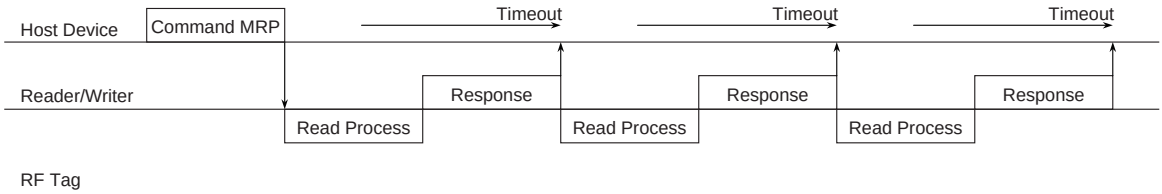
### • A sequence when the reader detects tags repeatedly.

At the end of the specified period, the reader returns a response (reporting the read tags' data) to the host.




### • A sequence when the reader carries out the transaction repeatedly and there is no tag.

At the end of the specified period, the reader returns a response (reporting "no tag") to the host.

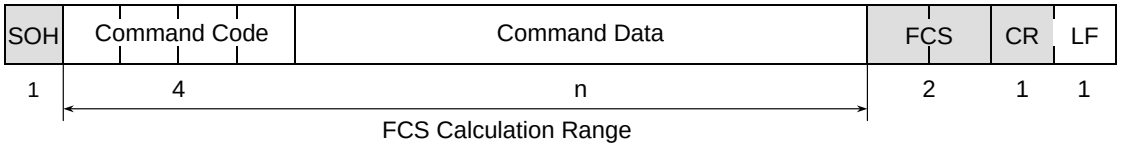


# Command/Response Format

Ethernet and RS-232C has almost the same command structure for command line I/F. Command frame has a Command Code area to control the R/W and Command Data area that is used with Command Code. Terminator that indicates the end of the frame is [LF].
RS-232C requires a start code [SOH], check data, and [CR] additionally. The start code shall be at the beginning of the frame, and the check data and the [CR] shall be just forward terminator [LF].

## Composition of command frame

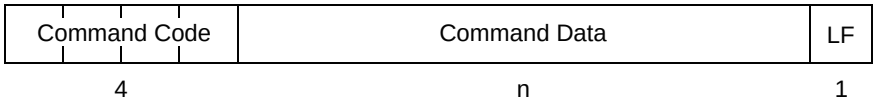
### ■ Command frame for RS-232C(The shaded portion is only RS-232C. )



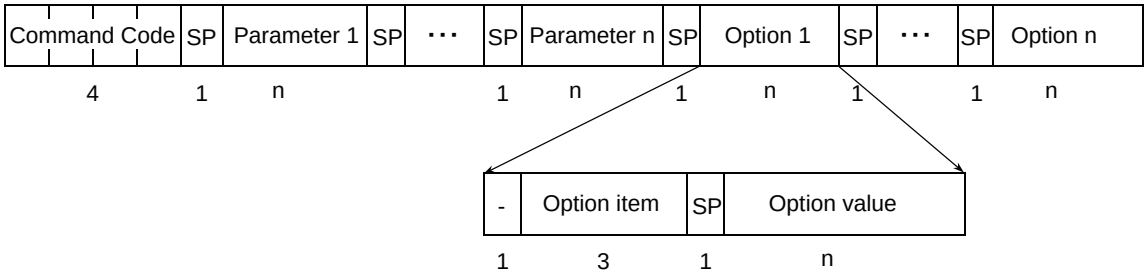

| | | |
|---|---|---|
| SOH (Start Code) | : | Indicates the beginning of the frame with SOH (For only RS-232C). |
| Command Code | : | Specifies the command the reader executes. |
| Command Data | : | Specifies the data for use with Command Code |
| FCS | : | Stands for Frame Check Sequence (hereinafter referred to as "FCS". The code is to detect an FCS error.)The result of the horizontal parity calculation from after SOH through just before the FCS is expressed by two characters of ASCII code (For only RS-232C). |
| CR, LF | : | Terminator CR(0Dh), LF(0Ah). It is only LF(0Ah) when the command line is Ethernet. |

The command frame length from the head to LF(0Ah) is 512 bytes or less.

### ■ Command frame for Ethernet



## ■ Command Format

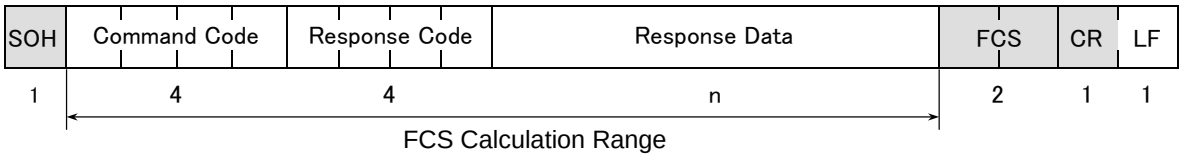



| Item | | Digit number | Explanation |
|---|---|---|---|
| Command Code | | 4 | Consists of four characters in ACSII format.<br>Refer to *Command Code List* for information on command codes.<br>*p. 69* |
| SP(Space)(20h) | | 1 | Between the elements (Parameters and Options), " " (space) has to be entered for one or more character. Even if a two or more characters of " " (space) are put in, they work same way as one-character " " (space). |
| Parameter | | n | Mandatory for each command. If there are multiple parameters in a single command, they must be separated with some spaces and specified in the specified order. Applicable parameter for each command is shown in the table in 3.1.5.1. |
| Option | - (Hyphen) (2Dh) | 1 | The code in which the option is shown is set. |
| | Option item | 3 | The option code is specified by three characters. |
| | Optional value | n | Optional for each command. If there are multiple options in a single command, they must be separated with some spaces. If it is not specified, default value will be employed. If multiple option items are specified, they shall be described continuously. Any order is acceptable. |

* Commands are acceptable regardless of whether upper or lower case letters are used. Any command works regardless the size combination of characters such as upper case letters, lower case letters, or mixed one.

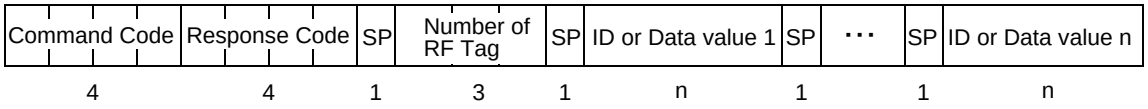
# Composition of response frame

## ■ Response frame for RS-232C(The shaded portion is only RS-232C. )




| | | |
|---|---|---|
| SOH (Start Code) | : | Indicates the beginning of the frame with SOH (For only RS-232C). |
| Command Code | : | Specifies the command the reader executes. |
| Response Code | : | Indicates the result code of command execution. |
| Command Data | : | Indicates the result data of command execution. |
| FCS | : | Stands for Frame Check Sequence (hereinafter referred to as "FCS". The code is to detect an FCS error.)The result of the horizontal parity calculation from after SOH through just before the FCS is expressed by two characters of ASCII code (For only RS-232C). |
| CR, LF | : | Terminator CR(0Dh), LF(0Ah). It is only LF(0Ah) when the command line is Ethernet. |

## ■ Response Format




| Item | Digit number | Explanation |
|---|---|---|
| Command Code | 4 | Set same characters specified as a command sent from the host. |
| Response Code | 4 | Indicates four-digit hexadecimal numbers by ASCII format. |
| SP(Space)(20h) | 1 | Between the elements (Parameters and Options), " " (space) has to be entered for one or more character. Even if a two or more characters of " " (space) are put in, they work same way as one-character " " (space). |
| Option | 1 | The code in which the option is shown is set. |
| Number of RF Tag | 3 | Number of RF Tags for communication commands. |
| ID or Data value | n | The RF tag ID(s) (or data) read by the reader with Hex code. If the reader reads multiple tags' IDs (or data), it indicates them in line with space(s) between each ID (or data). Data in hexadecimal numbers does not have [0x]. |

* All hexadecimal numbers as commands and data in the read tags are indicated with upper case letters (A to F).

# Command Code List

| Command Code | Command Name | Description | Executable in communication |
|---|---|---|---|
| (1) Communication Command (to communicate with tags) | | | |
| RDID | Read ID | Reads ID data from the tag memory. | No |
| WTID | Write ID | Writes ID data into the tag memory. | No |
| RDDT | Read Data | Reads data from the tag memory (including passwords). | No |
| WTDT | Write Data | Writes data to the tag memory (including passwords). | No |
| LOCK | Lock | Sets Lock function in the tag. | No |
| KILL | Kill | Disables the tag permanently. | No |
| (2) Setting Command (to set a condition). | | | |
| SETR | Set Reader | Sets the function settings in the reader. | No |
| GETR | Get Reader | Reads the function settings from reader. | Yes |
| SETO | Set Communication | Sets the communication settings in the reader (temporary setting). | No |
| GETO | Get Communication | Reads the communication settings from the reader. | Yes |
| SETC | Set Reader Operation | Sets the operation settings in the reader. | No |
| GETC | Get Reader Operation | Reads the operation settings from reader. | No |
| SAVE | Save communication settings | Save the communication condition into the nonvolatile memories in the reader (permanent setting). | No |
| (3) Control command (to control the action) | | | |
| INIT | Initialize | Initializes all settings in the reader. | No |
| STOP | Stop | Stops the communication with the RF Tags. | Yes |
| EXIO | External Input Output control | Eeads input/output port status.<br>Set condition of output port. | Yes |
| REST | Reset | Restarts the reader. | Yes |
| GBYE | Good Bye | Disconnects the Ethernet connection. | No |
| RRES | Request Resend | Requests to resend the last response data. | Yes |
| TEST | Test System | Tests the communication between host and the reader.<br>Reads the operation status from reader. | Yes |
| NOIS | Noise monitoring | Monitors noise level of the specified antenna. | No |
| (4) Undefined command (in the response frame only) | | | |
| ICMD | Illegal Command | Vommand code to be used in the response frame if the R/W receives undefined command. | - |

## ■ Exclusive commands for secure tag

Following decribed Secure RFID protocol command ( Secure function command).
Secure function command can be used the reader which certification number has 001AHB1004 or 001PVAB1002.
The reader which certification number is 001AHB001 can not use this function.
This command is only valid for Secure function command. The EPC global Class1 Generation2 RF tag which does not support secure function does not respond to this command.

| Command Code | Command Name | Description | Executable in communication |
|---|---|---|---|
| (1) Communication command (Exclusive commands for secure tag) | | | |
| LKRD | LocK ReaD (ReadLock) | Forbids reading data by bank unit (UII, TID, USER). | No |
| WTMW | WriTe Multiple Words (WriteMultipleWords) | Writes data into a maximum 8-word area at a time. | No |
| LKBK | LocK BlocK (BlockLock) | Locks up the USER area(s) by block unit. | No |
| LKRB | LocK Read Block (BlockReadLock) | Forbids reading data in the USER area(s) by block unit. | No |
| RDSI | ReaD System Information (GetSystemInfomation) | Reads information of targeted secure tag (including lock information). | No |
| SATT | Set ATTenuate (SetAttenuate) | Changes communication distance between the antenna and the secure tags. | No |
| WTPW | WriTe PassWord | Writes the USER password into tags. | No |

*A word shown in parentheses corresponds to the command name used in Secure Tag (Hibiki) protocol.

# Response Code List

| Category | Response Code | | Response Name | Description |
|---|---|---|---|---|
| | Main | Sub | | |
| Normal end | 00 | 00 | Normal end | The received command ended normally with no error. |
| Command error | 10 | 00 | Parity error | A parity error has occurred in one of the characters of the command frame (For only RS-232C). |
| | 11 | 00 | Framing error | A framing error has occurred in one of the characters of the command frame (For only RS-232C). |
| | 12 | 00 | Overrun erro | An overrun error has occurred in one of the characters of the command frame (For only RS-232C). |
| | 13 | 00 | FCS error | The command frame has an incorrect FCS (For only RS-232C). |
| | 14 | 0X (See Note1) | Command code error | Incorrect command has been received. The response code is ICMD. |
| | | 1X (See Note1) | Command parameter erro | Command parameter is incorrect. |
| | | 2X (See Note1) | Command option error | Command option is incorrect. |
| | 15 | 00 | Process error | Specified command can not be executed.<br>Ex. Caused by executing a communication command when the last command is being executed.<br>Ex. Caused by incorrect setting of filtering condition. |
| | | 0X (See Note1) | Filter error | Specified filter settins is incorrect.<br>Ex. Caused by incorrect setting of filtering condition. |
| | 18 | 00 | Frame length error | A command received from the host exceeds the receive buffer (512 Bytes). |
| RF Tag communication error | 70 | 00 | LBT busy error | Channel none by can LBT use. (The electric wave cannot be sent. ) |
| | | 1X (See Note1) | Communication error | During the transaction after tag detection, communication error or process time out has occurred, and consequently the transaction can not be completed normally.<br>Specified password does not match to the one of the target tag. |
| | | 2X (See Note1) | Communication error | During the transaction after tag detection, communication error or process time out has occurred, and consequently the transaction can not be completed normally<br>.* In the case of ID write/Data write, a part of data in the tag may have been written. |
| | 71 | 00 | Verification error | The reader has not written the data to the tag by reason of verification error. |
| | 7A | 00 | Address specification error | Specifying Bank/Address in the tag memory is incorrect and command can not be executed. |
| | 7B | 00 | Data write error | During the data write into the detected tag, sufficient power is not supplied to the tag. |
| | 7C | 1X (See Note1) | Antenna derection error | At the R/W starts up, an appropriate antenna has not been connected to the specified antenna port. |
| | | 2X (See Note1) | Antenna error | Error occurred with the antenna connected to the specified antenna port (even though the antenna is detected normally when start up). |
| | 7E | 00 | Lock error | When data write or read command is sent for the locked area. It depends on the tag's chip specifications. (For Monza chip, when these commands are sent for Lock Bit of User Memory because this area does not exist.)(See Note2) |
| | 7F | 0X (See Note1) | Tag error | The tag has been rejected the command process. |
| System error | 9A | XX (See Note1) | System error | An error that blocks command execution has been detected in the hardware (such as malfunction of inner circuit or temporary execution error caused by noise). |

Note1: 'x' character in response code means one character in the list of 0 to 9 or A to F.

Note2: Depends on the specification of IC chip equipped in the RF tag. ( It occurs at Monza chip when it specified the lock bit which does not exist in its memory map.

# Command Specification

## ■ Parameters and Options for Communication Commands

A communication command consists of parameter(s) mandated for command execution and option specified if necessary. Following table shows parameters of each command and available options.

| Command Code / Command Data | | Parameters (mandatory) | Options | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | seq | ant | tmo | tif | pwd | ptc |
| Read ID | RDID | Non | Yes | Yes | Yes | Yes | No | □ |
| Write ID | WTID | Write Data | Δ | Yes | Yes | Yes | Yes | □ |
| Read Data | RDDT | Memory Bank, Data Pointer, Data Length | Yes | Yes | Yes | Yes | Yes | □ |
| Write Data | WTDT | Memory Bank, Data Pointer, Write Data | Δ | Yes | Yes | Yes | Yes | □ |
| Lock | LOCK | Lock Code | Δ | Yes | Yes | Yes | Yes | □ |
| Kill | KILL | Non | Δ | Yes | Yes | Yes | Yes | □ |

- All options can be omitted. If option(s) is omitted, the default value is applied depending on the option item.
- Kill command requires the option item "-pwd" (if the "-pwd" is not used in command, 7Fxx error will occur.)

## ■ Parameter Details

To set parameters, items in the following list shall be chosen and be described in to the command one's way down the list.

| Parameter | Setting value |
|---|---|
| Memory Bank | Memory bank of a GEN2 tag for "Read Data" or "Write Data" shall be specified with the following number in decimal format.<br>- 0: Reserved Area<br>- 1: EPC Area<br>- 2: TID Area<br>- 3: User Area |
| Data Pointer | Memory address in the memory bank of the GEN2 tag for "Read Data" or "Write Data" shall be specified with number(s) in the following range in decimal format.<br>- Min: 0<br>- Max: 255 |
| Data Length | Memory size to be accessed for "Read Data" shall be specified with the word number(s) in the following range in decimal format.<br>- Min: 1<br>- Max: 32<br>-Note: One word length is 16bits. |
| Write Data | To write data into a tag with "Write ID" or "Write Data" command, the data shall be specified in 32-bit hexadecimal format as below. (0x not required)<br>- Format: XXXXXXXX ... XXXXXXXX<br>X: 0 to 9 , A to F<br>Ex. 12345678 |
| Lock Code | When Lock command is executed, this code shall be specified depending on the type of lock.<br>For GEN2, 10-digit Lock value shall be specified with 0, 1 or * (0 and 1 mean Action and * means MASK) for following five areas; Kill pwd, Access pwd, EPC memory, TID memory, and User memory.<br>•Format: XXXXXXXXXX<br>X: 0 , 1 or * (0:Off , 1:On , *:Don't care) |

| chr. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Action Fields | Kill pwd | | Access pwd | | EPC memory | | TID memory | | User memory | |
| | pwd read/ write | perma lock | pwd read/ write | perma lock | pwd write | perma lock | pwd write | perma lock | pwd write | perma lock |

## ■ Option Details

Option shall be specified with values following the code that indicates option type.

| Code | Item | Specified Value | Default Value |
|---|---|---|---|
| -seq | Communication sequence | Specifies the communication sequence according to the operating conditions. For only "Read ID" command, all parameters can be specified. For other commands, only SOC can be specified.<br>- SOC: Single Once<br>- SRP: Single Repeat<br>- MOC: Multi Once<br>- MRP: Multi Repeat | -seq SOC |
| -ant | Antenna ID | Can specify the order of antenna to operate from 1st to 9th with figure of 1, 2, 3 and 4. The figure 1 to 4 means antenna's identical number. If an antenna is specified multiply, the antenna executes sequence multiply depend on the order.<br>- Format: X ... XXXXXXXXX (Max 9 characters)<br>X: 1 to 4 | -ant 1 |
| -tmo | Timeout | Specifies time parameter for communication process in millisecond. The numbers after rounding down to the 10 is added milliseconds as a specified value (the least significant digit is always "0"). If the communication sequence is SOC, the specified value is the communication time. If the value is specified 0 (zero), communication process will continue until STOP command is executed. If the communication sequence is SRP/MOC/MRP, the specified value is maximum time between response (0 can't be specified on SRP/MOC/MRP sequence). (When you determine the value of Timeout, see the section 5.2 "Communication Time".)<br>- Min:0ms<br>- Max:2550ms(in DRM off or in firmware version 100-100-100-0)<br>10000ms(in DRM on and in firmware version 101-101-102-0 or later)<br>- Step:10ms | -tmo 250 |
| -tif | Tag Information | Specifies one or more items as additional information of tag communication results that are output in the response. Specified item(s) shall be returned according to the specified order with commas.<br>- ANT: An antenna number which reads the tag first.<br>- CNT: The count of tag read.<br>- EPC: EPC code only.<br>- PEP: PC bits and EPC code<br>- PER: PC bits, EPC code, and CRC<br>- LVL : Receiving level of signals sent from the tags*1<br>For ID read, EPC/PRP/PER determines the EPC data type to be returned. For ID write or Data write, if EPC/PEP/PER is specified, EPC data before rewriting shall be returned. (If EPC data length is 0, it will be "*".) | -tif EPC |
| -pwd | Password | Specifies the password data with 32-bit, 8 digit numbers in hexadecimal format for access of ID Write command, Data Read command, Data Write command, and Lock command, and Kill password for Kill command. (0x not required)<br>- XXXXXXXX<br>For ID Write, Data Write, or Lock, if this option is omitted or specified "00000000", Access password shall not be used .(If Access password of the Tag is 0x00000000, the tag can be processed. For Kill command, the Access password shall not be 0x00000000. If so, 7Fxx error occurs.) | -pwd 00000000 |
| -ptc | Tag Protocol | Specifies the number(s) that indicates the protocol type. Multiple numbers can be specified.<br>- 1: Class1 Generation2 | -ptc 1 |

If you do not specified options, the following condition will apply to each option as default setting.

| Option | Default |
|---|---|
| -seq | SOC |
| -ant | 1 |
| -tmo | 250 (ms) |
| -tif | No additional tag information |
| -pwd | Access password is not used |
| -ptc | 1 (C1G2) |

CHECK!

**Notes: Timeout settings.**
Please choose the timout value when you use repeat command (SRP/MRP).
It may cause the reader system halt error depending on the Ehternet or RS-232C communiction status due to lots of packets exchange. If Ethernet network which the reader connected is large, or communnication settings of RS-232C is low, it requires longer timeout value to avoid this error.

## ■ Required parameters and selectable options for each command for the Secure Tags.

Following table shows parameters to be set and selectable options for communication command operation.
Secure function is supported by certificication number at 001AHB1004, 001PVAB1002. The reader which certification number is 001AHB1001 can not use this function. Also Secure function can only use for the RF tags which supports secure RFID protocol. The standard EPC global Class1 Generation 2 RF tags does not work.

| Command Code \ Command Data | | Parameters (mandatory) | Options | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | seq | ant | tmo | tif | pwd | ptc |
| Lock Read | LKRD | Lock code | Δ | Yes | Yes | Yes | Yes | □ |
| Write Multiple Words | WTMW | Memory bank, data pointer, and data to be written | Δ | Yes | Yes | Yes | Yes | □ |
| Lock Block | LKBK | Block number, user password, and lock code | Δ | Yes | Yes | Yes | Yes | □ |
| Lock Read Block | LKRB | Block number, user password, and lock code | Δ | Yes | Yes | Yes | Yes | □ |
| Read System Information | RDSI | Non | Δ | Yes | Yes | Yes | No | □ |
| Set Attenuate | SATT | Level and lock information | Δ | Yes | Yes | Yes | Yes | □ |
| Write Pass Word | WTPW | Block number and user password | Δ | Yes | Yes | Yes | No | □ |

*Δ: Only SOC can be specified. □: Only "1" (= Gen2) can be specified.

If you do not specified options, the following condition will apply to each option as default setting.

| Option | Default |
|---|---|
| -seq | SOC |
| -ant | 1 |
| -tmo | 250 (ms) |
| -tif | No additional tag information |
| -pwd | Access password is not used |
| -ptc | 1 (C1G2) |

# Example FCS calculation for RS-232C

FCS is the result of the horizontal parity calculation (Exclusive OR) of the data right after SOH to the end of the Command data.

Command **RFID -seq MOC -ant 1 -tmo 500**

| | Command code | | | | Command data | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SOH | R | D | I | D | _ | - | s | e | q | _ | M | O | C | _ | - | a | n | t | _ | 1 | _ | - | t | m | o | _ | 5 | 0 | 0 |
| 01 | 52 | 44 | 49 | 44 | 20 | 2D | 73 | 65 | 71 | 20 | 4D | 4F | 43 | 20 | 2D | 61 | 6E | 74 | 20 | 31 | 20 | 2D | 74 | 6D | 6F | 20 | 35 | 30 | 30 |

| FCS | | CR | LF |
|---|---|---|---|
| 31 | 39 | 0D | 0A |

"19" is translated to "31" and "39" as ASCII code.

| Character | ASCII Code(Hex) | Binary | |
|---|---|---|---|
| R | 52 | 0101 | 0010 |
| D | 44 | 0100 | 0100 |
| I | 49 | 0100 | 1001 |
| D | 44 | 0100 | 0100 |
| (Space) | 20 | 0010 | 0000 |
| - | 2D | 0010 | 1101 |
| s | 73 | 0111 | 0011 |
| e | 65 | 0110 | 0101 |
| q | 71 | 0111 | 0001 |
| (Space) | 20 | 0010 | 0000 |
| M | 4D | 0100 | 1101 |
| O | 4F | 0100 | 1111 |
| C | 43 | 0100 | 0011 |
| (Space) | 20 | 0010 | 0000 |
| - | 2D | 0010 | 1101 |
| a | 61 | 0110 | 0001 |
| n | 6E | 0110 | 1110 |
| t | 74 | 0111 | 0100 |
| (Space) | 20 | 0010 | 0000 |
| 1 | 31 | 0011 | 0001 |
| (Space) | 20 | 0010 | 0000 |
| - | 2D | 0010 | 1101 |
| t | 74 | 0111 | 0100 |
| m | 6D | 0110 | 1101 |
| o | 6F | 0110 | 1111 |
| (Space) | 20 | 0010 | 0000 |
| 5 | 35 | 0011 | 0101 |
| 0 | 30 | 0011 | 0000 |
| 0 | 30 | 0011 | 0000 |
| XOR | 19 | 0001 | 1001 |

CHECK!

**Note : Programming for communication control**

This FCS represents the calculation result of horizontal parity with data and terminater strings. Therefore, The FCS includes all the code from 00h to FFh.( 00h to 7Fh, in case of data length is 7bits).

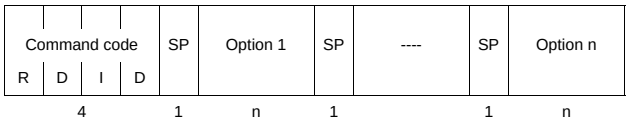
Program the communication control to consider that FCS may contain the control charactor such as SOH or CR.

* Depending on the programming tool or coding method, some of character code can not be used. Please check the programming tool before progrmmaing.

# Communication Command

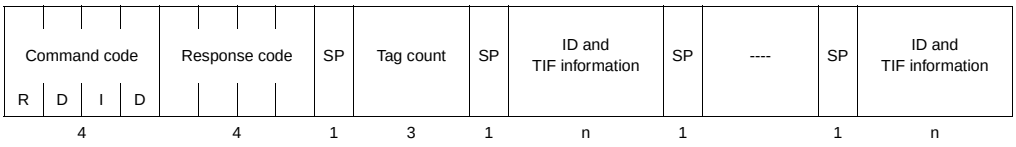
## Read ID (RDID)

### ■ Command Format




| Option code | Description | Available Optional Value |
|---|---|---|
| -seq | Communication sequence | SOC: Single Once<br>SRP: Single Repeat<br>MOC: Multi Once<br>MRP: Multi Repeat |
| -ant | Number of antenna | Specifies order of antenna operation with figure 1-4; max 9 characters. |
| -tmo | Process time out(msec) | 0, or from 100 to 5,000 in 10msec increments |
| -tif | Additional tag information | Additional information responded with data<br>ANT: antenna number<br>CNT: count of read tags<br>EPC: EPC code<br>PEP: PC bits and EPC code<br>PER: PC bits, EPC code and CRC<br>LVL: Receiving level of signals sent from the tags<br>Refer to the *Option Details* in detail.<br>*p. 73* |
| -ptc | Tag protocol | 1 |

### ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Tag count | Count of read tag(s) |
| ID and TIF information | ID read from tag and Tif information specified with command.<br>Each optional value for tif information lines with comma separation. |

## ■ Command/Response Example

Read ID (RDID)

| | |
|---|---|
| Command | *RDID(S)[options...]<LF>*<br>(S): Space code<br>[options...]: When it is necessary, the option is specified. |
| Response | *RDID[RC](S)[CNT](S)[ID1 with ITM1](S)...[IDn with ITMn]<LF>*<br>(S): Space code<br>[RC]: Response Code<br>[CNT]: Tag Count<br>[IDn with ITMn]: tagID with Items indicated by TIF option. Items are delimited by a comma.<br>Note: If EPC data length is "0" (zero), the ID shall be "*". |

Example 1) When command is processed with all options omitted and the R/W reads a single tag (Each option item is specified with default values):

*[Tx] RDID<LF>*

*[Rx] RDID0000 001 1234567890ABCDEF12345678<LF>*

* Without any options, the command is executed with [-seq SOC -ant 1 -tmo 250] and EPC data [1234567890ABCDEF12345678] is returned.

Example 2) When [SingleOnce, Antenna 1 and 2] is specified, the command is executed, and when the R/W reads two tags:

*[Tx] RDID -seq MOC -ant 12<LF>*

*[Rx] RDID0000 002 111111111111111111111111 222222222222222222222222<LF>*

Example 3) When [MultiRepeat, Antenna 1-4, read items; PC+EPC+CRC, Antenna, Read count] is specified, the command is executed, and when the reader reads a single tag:

*[Tx] RDID -seq MRP -ant 1234 -tif PER,ANT,CNT<LF>*

*[Rx] RDID0000 001 3000111111111111111111111111ABCD,2,3 <LF>*

* The code is returned with comma-separation. EPC code including PC code; 3000 and CRC; ABCD, antenna ID; 2, and read count; 3 are returned.

Example 4) When [MultiRepeat, Antenna; 1-4 (Antenna 1 is used as main antenna), Timeout; 1000ms] is specified, the command is executed and then the reader read 10 tags:

*[Tx] RDID -seq MRP -ant12131411 -tmo 1000<LF>*

*[Rx] RDID0000 010 111111111111111111111111 222222222222222222222222*
*...(7 Tag IDs)... AAAAAAAAAAAAAAAAAAAAAAAA<LF>*

Example 5) When [MultiOnce, Antenna 1, read items; EPC+LVL] is specified, the command is executed, and when the reader reads two tags.

*[Tx] RDID -seq MOC -ant 1 -tif EPC,LVL<LF>*

*[Rx] RDID0000 002 111111111111111111111111,-55.25 222222222222222222222222 -48.125<LF>*

Example 6) When an error occurred during communication process:

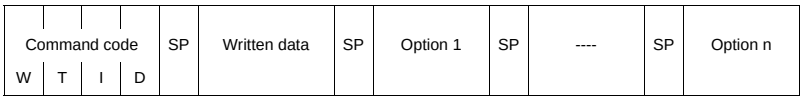
*[Tx] RDID -seq SOC -ant 4<LF>*

*[Rx] RDID7011<LF>*

* The error code [Code:7011] is returned.

# Write ID (WTID)

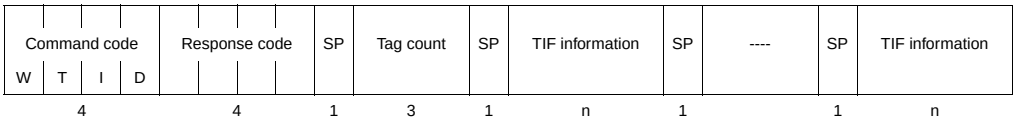
## ■ Command Format




| Item | Description |
|---|---|
| Written data | Specifies hexadecimal number in word (32 bits) increments. |

| Option code | Description | Available Optional Value |
|---|---|---|
| -seq | Communication sequence | SOC: Single Once |
| -ant | Number of antenna | Specifies order of antenna operation with figure 1-4; max 9 characters. |
| -tmo | Process time out(msec) | 0, or from 100 to 5,000 in 10msec increments |
| -tif | Additional tag information | Additional information responded with data<br>ANT: antenna number<br>CNT: count of read tags<br>EPC: EPC code<br>PEP: PC bits and EPC code<br>PER: PC bits, EPC code and CRC<br>Refer to the *Option Details* in detail.<br>*p. 73* |
| -pwd | Access password | Specifies a password with 8-digit hex number (32-bit word). It is essential unless the value in the area of tag Access Password is zero. It is active only when the area specified by tag is locked for read and write. |
| -ptc | Tag protocol | 1 |

## ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Tag count | Count of written tag(s) |
| TIF information | Tif information specified with command.<br>Each optional value for tif information lines with comma separation. |

## ■ Command/Response Example

Write ID (WTID)

| | |
|---|---|
| Command | *WTID(S)WriteData(S)[Options...]<LF>*<br>(S): Space code<br>[options...]: When it is necessary, the option is specified.<br>WriteData: Data to be written in 4-digit hexadecimal number (Max: 128 characters). |
| Response | *WTID[RC](S)[CNT](S)[ITM 1](S)...[ITEM n]<LF>*<br>(S): Space code<br>[RC]: Response Code<br>[CNT]: Tag Count<br>[ITM n]: Items indicated by TIF option. Items are delimited by a comma.<br>Note: If EPC/PEP/PER are specified for TIF, EPC data shall be the data before rewrite. If data length is zero during EPC specification, data shall become "*". |

Example 1) When all option values are default values and ID 1234567890ABCDEF12345678 is specified, the command is executed and write process has been completed successfully:

*[Tx] WTID 1234567890ABCDEF12345678<LF>*

*[Rx] WTID0000 001<LF>*

Example 2) When ID "555555555555555555555555" and EPC code are specified for write data and tag information, the command is executed and then the reader has succeeded.

*[Tx] WTID 555555555555555555555555 -tif EPC <LF>*

*[Rx] WTID0000 001 444444444444444444444444<LF>*

* If -tif is specified for EPC code, tag's EPC data before rewritten is returned. If the tag had an EPC data "444444444444444444444444" as last ID, response is as above.

Example 3) When 1234567890ABCDEF12345678 and antenna are specified for write data and tag information, the command is executed and then the reader has succeeded to write data with antenna 1.

*[Tx] WTID 1234567890ABCDEF12345678 -tif EPC,ANT<LF>*

*[Rx] WTID0000 001 *,1<LF>*

* If the tag had no EPC data before, [*] is returned.

Example 4) When FFFFFFFFFFFFFFFFFFFFFFFF, 2, and 300 are specified for ID, antenna, timeout and the command is executed but no tag is found:

*[Tx] WTID FFFFFFFFFFFFFFFFFFFFFFFF -ant 2 -tmo 300<LF>*

*[Rx] WTID0000 000<LF>*

Example 5) When 123412341234123412341234 and ABCDABCD are specified for ID and access password is executed but access password is not matched:

*[Tx] WTID 123412341234123412341234 -pwd ABCDABCD<LF>*

*[Rx] WTID0000 000<LF>*

Example 6) When an error has occurred during communication process:

*[Tx] WTID 1234567890ABCDEF12345678<LF>*

*[Rx] WTID7012<LF>*

* The error code [Code:7012] is returned.

# Read Data (RDDT)

## ■ Command Format

| Command code (R D D T) | SP | Memory Bank | SP | Data Pointer | SP | Data Length | SP | Option 1 | SP | ---- | SP | Option n |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 1 | 1 | 1 | 1 to 3 | 1 | 1 or 2 | 1 | n | 1 | | 1 | n |

| Parameter | Description |
|---|---|
| Memory bank | Specifies memory bank of Gen2 tag.<br>0: Reserved Area<br>1: EPC Area<br>2: TID Area<br>3: User Area |
| Data pointer | Specifies memory address intended to access in the memory bank.<br>0-255 |
| Data Length | Specifies hexadecimal number in word (16 bits) increments.<br>1-32 |

| Option code | Description | Available Optional Value |
|---|---|---|
| -seq | Communication sequence | SOC: Single Once<br>SRP: Single Repeat<br>MOC: Multi Once<br>MRP: Multi Repeat |
| -ant | Number of antenna | Specifies order of antenna operation with figure 1-4; max 9 characters. |
| -tmo | Process time out(msec) | 0, or from 100 to 5,000 in 10msec increments |
| -tif | Additional tag information | Additional information responded with data<br>ANT: antenna number<br>CNT: count of read tags<br>EPC: EPC code<br>PEP: PC bits and EPC code<br>PER: PC bits, EPC code and CRC<br>Refer to the *Option Details* in detail.<br>*p. 73* |
| -pwd | Access password | Specifies a password with 8-digit hex number (32-bit word). It is essential unless the value in the area of tag Access Password is zero. It is active only when the area specified by tag is locked for read and write. |
| -ptc | Tag protocol | 1 |

## ■ Response Format

| Command code (R D D T) | Response code | SP | Tag count | SP | Data and TIF information | SP | ---- | SP | Data and TIF information |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 4 | 1 | 3 | 1 | n | 1 | | 1 | n |

| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Tag count | Count of read tag(s) |
| Data and TIF information | Data read from tag and Tif information specified with command.<br>Each optional value for tif information lines with comma separation. |

## ■ Command/Response Example

Read Data (RDDT)

| | |
|---|---|
| Command | *RDDT(S)mbk(S)dpt(S)dln(S)[options...]<LF>*<br>(S): Space code<br>mbk: Memory Bank<br>dpt: Data Pointer<br>dln: Data Length<br>[options...]: When it is necessary, the option is specified. |
| Response | *RDDT[RC](S)[CNT](S)[Data 1 with ITM 1](S)...[Data n with ITM n](<LF>*<br>(S): Space code<br>[RC]: Response Code<br>[CNT]: Tag Count<br>[Data n with ITM n]: Data with Items indicated by TIF option. Items are delimited by a comma. |

Example 1) When [Memory bank; 0, Start address(=Data pointer); 0, word count to be read(=Data length); 1] is specified, other settings are default value and then read process has completed successfully:

*[Tx] RDDT 0 0 1<LF>*

*[Rx] RDDT0000 001 1234<LF>*

Example 2) When [Memory bank; 1, Start address(=Data pointer); 0, word count to be read(=Data length); 8] is specified, other settings are default value and then read process has completed successfully:

*[Tx] RDDT 1 0 4<LF>*

*[Rx] RDDT0000 001 BCAD300055555555<LF>*

* If -tif is specified for EPC code, tag's EPC data before rewritten is returned. If the tag had an EPC data "444444444444444444444444" as last ID, response is as above.

Example 3) ) When [Memory bank; 1, Start address(=Data pointer); 2, word count to be read(=Data length); 3, Antenna; 1 to 3, Tag information; EPC and antenna id] is specified and read process has succeeded:

*[Tx] RDDT 1 2 3 -ant 123 -tif EPC,ANT<LF>*

*[Rx] RDDT0000 001 111122223333,1234567890ABCDEF12345678,2<LF>*

* In this case, the read data is [111122223333], the tag EPC code is [1234567890ABCDEF12345678], and the read antenna ID is [2].

Example 4) When indicated address can not supported:

*[Tx] RDDT 0 0 8<LF>*

*[Rx] RDDT0000 000<LF>*

* No count data is returned.

Example 5) When an incorrect address[1000] is specified:

*[Tx] RDDT 0 1000 1 -ant 123<LF>*

*[Rx] RDDT1412<LF>*

* The command data error [Code:1412] is returned.

Example 6) When an error has occurred during communication process:

*[Tx] RDDT 0 0 1 -ant 123<LF>*

*[Rx] RDDT7012<LF>*

* The error code [Code:7012] is returned.

# Write Data (WTDT)

## ■ Command Format

| Command code (W T D T) | SP | Memory Bank | SP | Data Pointer | SP | Written data | SP | Option 1 | SP | ---- | SP | Option n |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 1 | 1 | 1 | 1 to 3 | 1 | n | 1 | n | 1 | | 1 | n |

| Item | Description |
|---|---|
| Memory bank | Specifies memory bank of Gen2 tag.<br>0: Reserved Area<br>1: EPC Area<br>2: TID Area<br>3: User Area |
| Data pointer | Specifies memory address intended to access in the memory bank.<br>0-255 |
| Written data | Specifies hexadecimal number in word (16 bits) increments.<br>1-32 |

| Option code | Description | Available Optional Value |
|---|---|---|
| -seq | Communication sequence | SOC: Single Once |
| -ant | Number of antenna | Specifies order of antenna operation with figure 1-4; max 9 characters. |
| -tmo | Process time out(msec) | 0, or from 100 to 5,000 in 10msec increments |
| -tif | Additional tag information | Additional information responded with data<br>ANT: antenna number<br>CNT: count of read tags<br>EPC: EPC code<br>PEP: PC bits and EPC code<br>PER: PC bits, EPC code and CRC<br>Refer to the *Option Details* in detail.<br>*p. 73* |
| -pwd | Access password | Specifies a password with 8-digit hex number (32-bit word). It is essential unless the value in the area of tag Access Password is zero. It is active only when the area specified by tag is locked for read and write. |
| -ptc | Tag protocol | 1 |

## ■ Response Format

| Command code (W T D T) | Response code | SP | Tag count | SP | TIF information | SP | ---- | SP | TIF information |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 4 | 1 | 3 | 1 | n | 1 | | 1 | n |

| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Tag count | Count of written tag(s) |
| TIF information | Tif information specified with command.<br>Each optional value for tif information lines with comma separation. |

## ■ Command/Response Example

Write Data (WTDT)

| | |
|---|---|
| Command | *WTDT(S)mbk(S)dpt(S)WriteData(S)[options...]<LF>*<br>(S): Space code<br>mbk: Memory Bank<br>dpt: Data Pointer<br>WriteData; Data to be written<br>[options...]: When it is necessary, the option is specified. |
| Response | *WTDT[RC](S)[CNT](S)[ITM 1](S)...[ITM n]<LF>*<br>(S): Space code<br>[RC]: Response Code<br>[CNT]: Tag Count<br>[ITM n]: Items indicated by TIF option. Items are delimited by a comma.<br>Note: If EPC/PEP/PER are specified for TIF option, EPC data shall be the data before rewrite. If data length is zero during EPC specification, data shall become "*". |

Example 1) When [Memory bank; 0, Start address(=Data pointer); 0, Data; 0x1234 (one word)] is specified, other setting are default and then the write process has been succeeded:

*[Tx] WTDT 0 0 1234<LF>*

*[Rx] WTDT0000 001<LF>*

Example 2) When [Memory bank;1, Start address(=Data pointer); 3, Data; 0x1234567890ABCDEF12345678, Antenna; 2 and 3, Timeout; 200, Tag information; antenna id] is specified:

*[Tx] WTDT 1 3 1234567890ABCDEF12345678 -ant 23 -tmo 200 -tif ANT<LF>*

*[Rx] WTDT0000 001 2<LF>*

* In this case, the response code has an antenna ID which is used in writing process.

Example 3) When specified address is not supported:

*[Tx] WTDT 1 8 12345678<LF>*

*[Rx] WTDT0000 000<LF>*

* No count response is returned.

Example 4) When specified address is locked:

*[Tx] WTDT 0 0 AAAAAAAA<LF>*

*[Rx] WTDT0000 000<LF>*

* No count response is returned.

Example 5) When [Memory bank; 1, Start address=(Data pointer); 2, Data; 0xABCDEFGH] is specified and a format error has occurred:

*[Tx] WTDT 1 2 ABCDEFGH<LF>*

*[Rx] WTDT1412<LF>*

* The error code [Code:1412] is returned.

Example 6) When an error occurred during communication process:

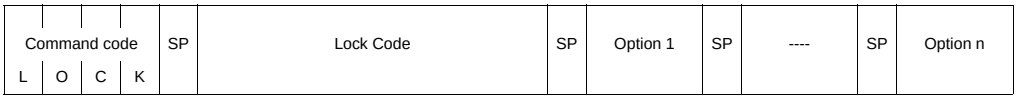
*[Tx] WTDT 1 32 1234567890ABCDEF12345678 -ant 23<LF>*

*[Rx] WTDT7011<LF>*

* The error code [Code:7011] is returned.

# Lock (LOCK)

## ■ Command Format



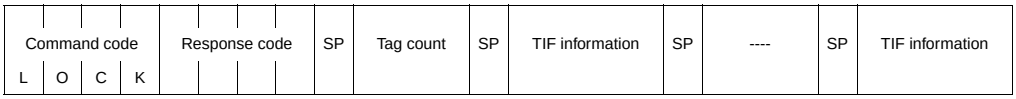

| Item | Description |
|---|---|
| Lock Code | Specifies a lock type of an (password / memory) area intended to be controlled with double digits code shown as below. |

| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|---|---|---|---|
| Kill pwd | | Access pwd | | EPC memory | | TID memory | | User memory | |
| pwd R/W | perma lock | pwd R/W | perma lock | pwd write | perma lock | pwd write | perma lock | pwd write | perma lock |

| Pwd (R/W) (Write) | Perma lock | Type of lock |
|---|---|---|
| 0 | 0 | Cancels temporal lock. |
| 0 | 1 | Unlocks permanently. |
| 1 | 0 | Locks temporally. (It can be unlocked.) |
| 1 | 1 | Locks permanently. (It cannot be unlocked.) |
| * | * | No lock control |

| Option code | Description | Available Optional Value |
|---|---|---|
| -seq | Communication sequence | SOC: Single Once |
| -ant | Number of antenna | Specifies order of antenna operation with figure 1-4; max 9 characters. |
| -tmo | Process time out(msec) | 0, or from 100 to 5,000 in 10msec increments |
| -tif | Additional tag information | Additional information responded with data<br>ANT: antenna number<br>CNT: count of read tags<br>EPC: EPC code<br>PEP: PC bits and EPC code<br>PER: PC bits, EPC code and CRC<br>Refer to the *Option Details* in detail.<br>*p. 73* |
| -pwd | Access password | Specifies a password with 8-digit hex number (32-bit word). It is essential unless the value in the area of tag Access Password is zero. It is active only when the area specified by tag is locked for read and write. |
| -ptc | Tag protocol | 1 |

## ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Tag count | Count of locked tag(s) |
| TIF information | Tif information specified with command.<br>Each optional value for tif information lines with comma separation. |

## ■ Command/Response Example

Lock (LOCK)

| | |
|---|---|
| Command | *LOCK(S)LockCode(S)[options...]<LF>*<br>(S): Space code<br>LockCode: Lock Code (10 characters 0/1/*)<br>[options...]: When it is necessary, the option is specified. |
| Response | *LOCK[RC](S)[CNT](S)[ITM 1](S)...[ITM n]<LF>*<br>(S): Space code<br>[RC]: Response Code<br>[CNT]: Tag Count<br>[ITM n]: Items indicated by TIF option. Items are delimited by a comma. |

Example 1) When [EPC memory; locked temporarily] is set:

*[Tx] LOCK ****10****<LF>*

*[Rx] LOCK0000 001<LF>*

Example 2) When [Access password and Kill password; locked temporarily] is set with password; 0xABCDABCD:

*[Tx] LOCK 1010****** -pwd ABCDABCD<LF>*

*[Rx] LOCK0000 001<LF>*

Example 3) When [Access password and Kill password; unlocked] is set with [password; 0xAAAAAAAA, tag information; EPC code and antenna:

*[Tx] LOCK 0000****** -pwd AAAAAAAA -tif EPC,ANT<LF>*

*[Rx] LOCK0000 001 777777777777777777777777,1<LF>*

Example 4) When [Password; 0xFFFFFFFF, all memories are locked permanently] is set:

*[[Tx] LOCK 1111111111 -pwd FFFFFFFF<LF>*

*[Rx] LOCK0000 001<LF>*

* The EPC code of the tag is [1234567890ABCDEF12345678].

Example 5) When [Password; 0x12341234, all memories are locked permanently] is specified and specified password is incorrect:

*[Tx] LOCK 1111111111 -pwd 12341234<LF>*

*[Rx] LOCK7011<LF>*

* The communication error [Code:7011 (in this case)] is returned.

Example 6) When [Password; 0xAAAAAAAA, Lock code;22222222] is specified and specified lock code is incorrect:

*[Tx] LOCK 2222222222 -pwd AAAAAAAA<LF>*

*[Rx] LOCK1412<LF>*

* The error code [Code:1412] is returned.

# Kill (KILL)

## ■ Command Format

| Command code | | | | SP | Kill password | SP | Option 1 | SP | ---- | SP | Option n |
|---|---|---|---|---|---|---|---|---|---|---|---|
| K | I | L | L | | -pwd XXXXXXXX | | | | | | |
| 4 | | | | 1 | 13 | 1 | n | 1 | | 1 | n |

| Item | Description |
|---|---|
| Kill password | Specifies a KILL Password.<br>The password set previously in the Kill password area corresponding.<br>- pwd XXXXXXXX<br><br>* When all 0 is specified, the KILL command cannot be used.<br>The values other than 0 are set to KILL Password area before KILL Command is executed. |

| Option code | Description | Available Optional Value |
|---|---|---|
| -seq | Communication sequence | SOC: Single Once |
| -ant | Number of antenna | Specifies order of antenna operation with figure 1-4; max 9 characters. |
| -tmo | Process time out(msec) | 0, or from 100 to 5,000 in 10msec increments |
| -tif | Additional tag information | Additional information responded with data<br>ANT: antenna number<br>CNT: count of read tags<br>EPC: EPC code<br>PEP: PC bits and EPC code<br>PER: PC bits, EPC code and CRC<br>Refer to the *Option Details* in detail.<br>*p. 73* |
| -ptc | Tag protocol | 1 |

## ■ Response Format

| Command code | | | | Response code | | | | SP | Tag count | SP | TIF information | SP | ---- | SP | TIF information |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| K | I | L | L | | | | | | | | | | | | |
| 4 | | | | 4 | | | | 1 | 3 | 1 | n | 1 | | 1 | n |

| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Tag count | Count of killed tag(s) |
| TIF information | Tif information specified with command.<br>Each optional value for tif information lines with comma separation. |

## ■ Command/Response Example

Kill (KILL)

| | |
|---|---|
| Command | *KILL(S)[options...]<LF>*<br>(S): Space code<br>[options...]: When it is necessary, the option is specified. |
| Response | *KILL[RC](S)[CNT](S)[ITM n](S)...[ITM n]<LF>*<br>(S): Space code<br>[RC]: Response Code<br>[CNT]: Tag Count<br>[ITMn]: Items indicated by TIF option. Items are delimited by a comma. |

Example 1) When [Password; 0x22222222] is specified and then KILL command is completed normally:

*[Tx] KILL -pwd 22222222<LF>*

*[Rx] KILL0000 001<LF>*

Example 2) When [Password; 0xAAAABBBB, Antenna; 3, Tag information; PER and ANT] is specified and KILL command has completed normally:

*[Tx] KILL -pwd AAAABBBB -ant 3 -tif PER,ANT<LF>*

*[Rx] KILL0000 001 30001234567890ABCDEF12345678ABCD,3<LF>*

* The PC code of the tag is [3000], EPC code is [1234567890ABCDEF12345678], CRC is [ABCD], and command executed Antenna ID is [3].

Example 3) When [Password; 0x12345678] is specified and password data has been incorrect:

*[Tx] KILL -pwd 12345678<LF>*

*[Rx] KILL7012<LF>*

* The error code [Code:7012] is returned.

Example 4) When [Password; 0x12] is specified and password length has been incorrect:

*[Tx] KILL -pwd 12<LF>*

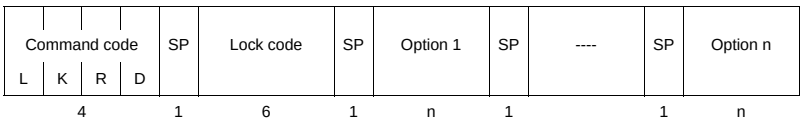
*[Rx] KILL1421<LF>*

* The error code [Code:1421] is returned.

# Communication command (Exclusive commands for secure tag)

## Lock Read (LKRD)

### ■ Command Format



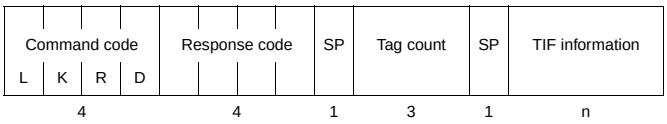

| Item | Description |
|---|---|
| Lock Code | Specifies a lock type of an (memory) area intended to be controlled with double digits code shown as below. |

| (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|
| EPC memory | | TID memory | | User memory | |
| pwd write | perma lock | pwd write | perma lock | pwd write | perma lock |

| Pwd read | Perma lock | Type of lock |
|---|---|---|
| 0 | 0 | Cancels temporal lock. |
| 0 | 1 | Unlocks permanently. |
| 1 | 0 | Locks temporally. (It can be unlocked.) |
| 1 | 1 | Locks permanently. (It cannot be unlocked.) |
| * | * | No lock control |

| Option code | Description | Available Optional Value |
|---|---|---|
| -seq | Communication sequence | SOC: Single Once |
| -ant | Number of antenna | Specifies order of antenna operation with figure 1-4; max 9 characters.<br>The figure 1 to 4 is antenna's identical number. |
| -tmo | Process time out(msec) | 0, or from 10 to 2550 in 10msec increments (in DRM off)<br>0, or from 10 to 10000 in 10msec increments (in DRM on) |
| -tif | Additional tag information | Additional information responded with data<br>ANT: antenna number<br>CNT: count of read tags<br>EPC: EPC code<br>PEP: PC bits and EPC code<br>PER: PC bits, EPC code and CRC<br>Refer to the *Option Details* in detail.<br>*p. 73* |
| -pwd | Access password | Specifies a password with 8-digit hex number (32-bit word). It is essential unless the value in the area of tag Access Password is zero. |
| -ptc | Tag protocol | 1 (Gen2) |

## ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Tag count | Count of locked tag(s) |
| TIF information | Tif information specified with command.<br>Each optional value for tif information lines with comma separation. |

CHECK! Secure function is supported by certificication number at 001AHB1004, 001PVAB1002. The reader which certification number is 001AHB1001 can not use this function. Also Secure function can only use for the RF tags which supports secure RFID protocol. The standard EPC global Class1 Generation 2 RF tags does not work.

# Write Multiple Words (WTMW)

## ■ Command Format

| Command code | SP | Memory Bank | SP | Data Pointer | SP | Written data | SP | Option 1 | SP | ---- | SP | Option n |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| W T M W | | | | | | | | | | | | |
| 4 | 1 | 1 | 1 | 1 to 3 | 1 | (1 to 3)×4 | 1 | n | 1 | | 1 | n |

| Item | Description |
|---|---|
| Memory bank | Specifies memory bank of Gen2 tag.<br>0: Reserved Area<br>1: EPC Area<br>2: TID Area<br>3: User Area |
| Data pointer | Specifies memory address intended to access in the memory bank. (in word [16 bits] increments)<br>0-255 |
| Written data | Specifies hexadecimal number in word (16 bits) increments; maximum 32 words |

| Option code | Description | Available Optional Value |
|---|---|---|
| -seq | Communication sequence | SOC: Single Once |
| -ant | Number of antenna | Specifies order of antenna operation with figure 1-4; max 9 characters.<br>The figure 1 to 4 is antenna's identical number. |
| -tmo | Process time out(msec) | 0, or from 10 to 2550 in 10msec increments (in DRM off)<br>0, or from 10 to 10000 in 10msec increments (in DRM on) |
| -tif | Additional tag information | Additional information responded with data<br>ANT: antenna number<br>CNT: count of read tags<br>EPC: EPC code<br>PEP: PC bits and EPC code<br>PER: PC bits, EPC code and CRC<br>Refer to the *Option Details* in detail.<br>*p. 73* |
| -pwd | Access password | Specifies a password with 8-digit hex number (32-bit word).<br>It is essential unless the value in the area of tag Access Password is zero. It is active only when the area specified by tag is locked for read and write. |
| -ptc | Tag protocol | 1 (Gen2) |

## ■ Response Format

| Command code | Response code | SP | Tag count | SP | TIF information |
|---|---|---|---|---|---|
| W T M W | | | | | |
| 4 | 4 | 1 | 3 | 1 | n |

| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Tag count | Count of written tag(s) |
| TIF information | Tif information specified with command.<br>Each optional value for tif information lines with comma separation. |

CHECK! Secure function is supported by certificication number at 001AHB1004, 001PVAB1002. The reader which certification number is 001AHB1001 can not use this function. Also Secure function can only use for the RF tags which supports secure RFID protocol. The standard EPC global Class1 Generation 2 RF tags does not work.

# Lock Block (LKBK)

## ■ Command Format

| Command code (L K B K) | SP | Block number | SP | User password | SP | Lock code | SP | Option 1 | SP | ---- | SP | Option n |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 1 | 1 | 1 | 8 | 1 | 4 | 1 | n | 1 | | 1 | n |

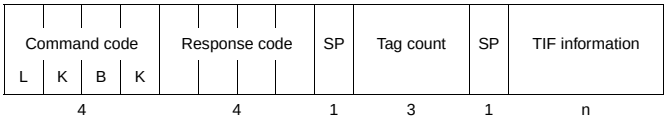
| Item | Description |
|---|---|
| Block number | Specifies memory address of the targeted area in the user memory.<br>1-5 |
| User password | Specifies a password for each user area.<br>The password should be same as the password set previously in the password area corresponding to the block number set above. |
| Lock Code | Specifies a lock type of an (password/memory) area intended to be controlled with double digits code shown as below. |

| (1) | (2) | (3) | (4) |
|---|---|---|---|
| u-pass | | U-Pass User | |
| pwd R/W | perma lock | pwd write | perma lock |

| Pwd (R/W) (Write) | Perma lock | Type of lock |
|---|---|---|
| 0 | 0 | Cancels temporal lock. |
| 0 | 1 | Unlocks permanently. |
| 1 | 0 | Locks temporally. (It can be unlocked.) |
| 1 | 1 | Locks permanently. (It cannot be unlocked.) |
| * | * | No lock control |

| Option code | Description | Available Optional Value |
|---|---|---|
| -seq | Communication sequence | SOC: Single Once |
| -ant | Number of antenna | Specifies order of antenna operation with figure 1-4; max 9 characters.<br>The figure 1 to 4 is antenna's identical number. |
| -tmo | Process time out(msec) | 0, or from 10 to 2550 in 10msec increments (in DRM off)<br>0, or from 10 to 10000 in 10msec increments (in DRM on) |
| -tif | Additional tag information | Additional information responded with data<br>ANT: antenna number<br>CNT: count of read tags<br>EPC: EPC code<br>PEP: PC bits and EPC code<br>PER: PC bits, EPC code and CRC<br>Refer to the *Option Details* in detail.<br>*p. 73* |
| -pwd | Access password | Specifies a password with 8-digit hex number (32-bit word).<br>It is essential unless the value in the area of tag Access Password is zero. |
| -ptc | Tag protocol | 1 (Gen2) |

## ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Tag count | Count of locked tag(s) |
| TIF information | Tif information specified with command.<br>Each optional value for tif information lines with comma separation. |

CHECK! Secure function is supported by certificication number at 001AHB1004, 001PVAB1002. The reader which certification number is 001AHB1001 can not use this function. Also Secure function can only use for the RF tags which supports secure RFID protocol. The standard EPC global Class1 Generation 2 RF tags does not work.

# Lock Read Block (LKRB)

## ■ Command Format

| Command code (L K R B) | SP | Block number | SP | User password | SP | Lock code | SP | Option 1 | SP | ---- | SP | Option n |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 1 | 1 | 1 | 8 | 1 | 2 | 1 | n | 1 | | 1 | n |

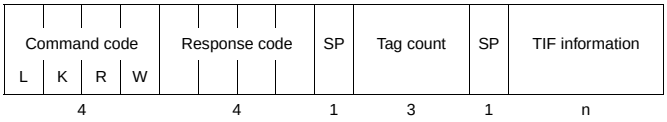
| Item | Description |
|---|---|
| Block number | Specifies memory address of the targeted area in the user memory.<br>1-5 |
| User password | Specifies a password for each user area.<br>The password should be same as the password set previously in the password area corresponding to the block number set above. |
| Lock Code | Specifies a lock type of an (password/memory) area intended to be controlled with double digits code shown as below. |

| (1) | (2) |
|---|---|
| U-Pass User | |
| pwd read | perma lock |

| Pwd (R/W) (Write) | Perma lock | Type of lock |
|---|---|---|
| 0 | 0 | Cancels temporal lock. |
| 0 | 1 | Unlocks permanently. |
| 1 | 0 | Locks temporally. (It can be unlocked.) |
| 1 | 1 | Locks permanently. (It cannot be unlocked.) |
| * | * | No lock control |

| Option code | Description | Available Optional Value |
|---|---|---|
| -seq | Communication sequence | SOC: Single Once |
| -ant | Number of antenna | Specifies order of antenna operation with figure 1-4; max 9 characters.<br>The figure 1 to 4 is antenna's identical number. |
| -tmo | Process time out(msec) | 0, or from 10 to 2550 in 10msec increments (in DRM off)<br>0, or from 10 to 10000 in 10msec increments (in DRM on) |
| -tif | Additional tag information | Additional information responded with data<br>ANT: antenna number<br>CNT: count of read tags<br>EPC: EPC code<br>PEP: PC bits and EPC code<br>PER: PC bits, EPC code and CRC<br>Refer to the *Option Details* in detail.<br>*p. 73* |
| -pwd | Access password | Specifies a password with 8-digit hex number (32-bit word).<br>It is essential unless the value in the area of tag Access Password is zero. |
| -ptc | Tag protocol | 1 (Gen2) |

## ■ Response Format

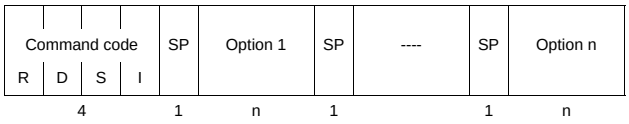



| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Tag count | Count of locked tag(s) |
| TIF information | Tif information specified with command.<br>Each optional value for tif information lines with comma separation. |

CHECK! Secure function is supported by certificication number at 001AHB1004, 001PVAB1002. The reader which certification number is 001AHB1001 can not use this function. Also Secure function can only use for the RF tags which supports secure RFID protocol. The standard EPC global Class1 Generation 2 RF tags does not work.

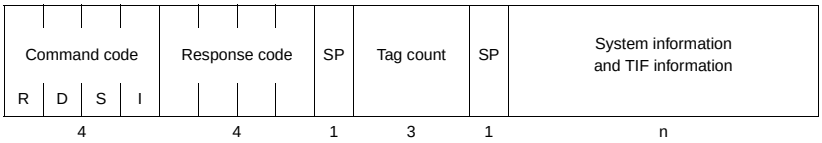
# Read System Information (RDSI)

## ■ Command Format




| Option code | Description | Available Optional Value |
|---|---|---|
| -seq | Communication sequence | SOC: Single Once |
| -ant | Number of antenna | Specifies order of antenna operation with figure 1-4; max 9 characters.<br>The figure 1 to 4 is antenna's identical number. |
| -tmo | Process time out (msec) | 0, or from 10 to 2550 in 10msec increments (in DRM off)<br>0, or from 10 to 10000 in 10msec increments (in DRM on) |
| -tif | Additional tag information | Additional information responded with data<br>ANT: antenna number<br>CNT: count of read tags<br>EPC: EPC code<br>PEP: PC bits and EPC code<br>PER: PC bits, EPC code and CRC<br>Refer to the *Option Details* in detail.<br>*p. 73* |
| -ptc | Tag protocol | 1 (Gen2) |

## ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Tag count | Count of read tag(s) |
| System information and TIF information | System information of the read tags (refer to following page in detail) and Tif information specified with command.<br>Each optional value for tif information lines with comma separation. |

## ■ System Information Data Format

| Information Flag | Reserved Mem-size | EPC Mem-size | TID Mem-size | USER Mem-size | ATT Level | Bank Lock | Bank Lock Read | Bank Lock R/W | Bank Lock R/W |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 2 | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |

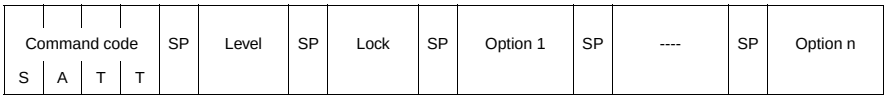
<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Information Flag</td><td>Specifies a lock type of an (password/memory) area intended to be controlled with double digits code shown as below.
<table>
<tr><th>Bit</th><th>Description</th><th>Walue</th></tr>
<tr><td>1</td><td>Reserved Mem-size</td><td>0/1</td></tr>
<tr><td>2</td><td>EPC Mem-size</td><td>0/1</td></tr>
<tr><td>3</td><td>TID Mem-size</td><td>0/1</td></tr>
<tr><td>4</td><td>User Mem-size</td><td>0/1</td></tr>
<tr><td>5</td><td>ATT Level</td><td>0/1</td></tr>
<tr><td>6</td><td>Bank Lock</td><td>0/1</td></tr>
<tr><td>7</td><td>Block Read Lock</td><td>0/1</td></tr>
<tr><td>8</td><td>Block Password Read/Write Lock</td><td>0/1</td></tr>
<tr><td>9</td><td>Block Write Lock</td><td>0/1</td></tr>
<tr><td>10-16</td><td>RFU</td><td>0/1</td></tr>
</table></td></tr>
<tr><td>Reserved Mem-size</td><td rowspan="4">Each area (memory) size<br>(Unit: word)</td></tr>
<tr><td>EPC Mem-size</td></tr>
<tr><td>TID Mem-size</td></tr>
<tr><td>User Mem-size</td></tr>
<tr><td>ATT Level</td><td>Attenuate level of tag<br>Level specified with “Set Attenuate level“ command.</td></tr>
<tr><td>Bank Lock</td><td>Represents lock status of each bank with bit.
<table>
<tr><th>Bit</th><th colspan="2">Description</th><th>Walue</th></tr>
<tr><td>1</td><td rowspan="2">User memory</td><td>Pwd read</td><td>0/1</td></tr>
<tr><td>2</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>3</td><td rowspan="2">TID memory</td><td>Pwd read</td><td>0/1</td></tr>
<tr><td>4</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>5</td><td rowspan="2">UII memory</td><td>Pwd read</td><td>0/1</td></tr>
<tr><td>6</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>7</td><td rowspan="2">Access pwd</td><td>Pwd R/W</td><td>0/1</td></tr>
<tr><td>8</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>9</td><td rowspan="2">User memory</td><td>Pwd write</td><td>0/1</td></tr>
<tr><td>10</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>11</td><td rowspan="2">TID memory</td><td>Pwd write</td><td>0/1</td></tr>
<tr><td>12</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>13</td><td rowspan="2">UII memory</td><td>Pwd write</td><td>0/1</td></tr>
<tr><td>14</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>15</td><td rowspan="2">Kill pwd</td><td>Pwd R/W</td><td>0/1</td></tr>
<tr><td>16</td><td>Perma lock</td><td>0/1</td></tr>
</table>
Values are specified by "Lock" or "Read Lock" command.</td></tr>
</table>

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Block Read Lock</td><td>Represents lock status of each block with bit.
<table>
<tr><th>Bit</th><th colspan="2">Description</th><th>Walue</th></tr>
<tr><td>1-6</td><td colspan="2">RFU</td><td>0</td></tr>
<tr><td>7</td><td rowspan="2">U5-Pass User</td><td>Pwd read</td><td>0/1</td></tr>
<tr><td>8</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>9</td><td rowspan="2">U4-Pass User</td><td>Pwd read</td><td>0/1</td></tr>
<tr><td>10</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>11</td><td rowspan="2">U3-Pass User</td><td>Pwd read</td><td>0/1</td></tr>
<tr><td>12</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>13</td><td rowspan="2">U2-Pass User</td><td>Pwd read</td><td>0/1</td></tr>
<tr><td>14</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>15</td><td rowspan="2">U1-Pass User</td><td>Pwd read</td><td>0/1</td></tr>
<tr><td>16</td><td>Perma lock</td><td>0/1</td></tr>
</table>
Values are specified by "Block Read Lock" command.</td></tr>
<tr><td>Block Password Read/Write Lock</td><td>Represents lock status of password for each block with bit.
<table>
<tr><th>Bit</th><th colspan="2">Description</th><th>Walue</th></tr>
<tr><td>1-6</td><td colspan="2">RFU</td><td>0</td></tr>
<tr><td>7</td><td rowspan="2">U5-Pass</td><td>Pwd R/W</td><td>0/1</td></tr>
<tr><td>8</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>9</td><td rowspan="2">U4-Pass</td><td>Pwd R/W</td><td>0/1</td></tr>
<tr><td>10</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>11</td><td rowspan="2">U3-Pass</td><td>Pwd R/W</td><td>0/1</td></tr>
<tr><td>12</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>13</td><td rowspan="2">U2-Pass</td><td>Pwd R/W</td><td>0/1</td></tr>
<tr><td>14</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>15</td><td rowspan="2">U1-Pass</td><td>Pwd R/W</td><td>0/1</td></tr>
<tr><td>16</td><td>Perma lock</td><td>0/1</td></tr>
</table>
Values are specified by "Block Lock" command.</td></tr>
<tr><td>Block Write Lock</td><td>Represents write lock status for each block with bit.
<table>
<tr><th>Bit</th><th colspan="2">Description</th><th>Walue</th></tr>
<tr><td>1-6</td><td colspan="2">RFU</td><td>0</td></tr>
<tr><td>7</td><td rowspan="2">U5-Pass User</td><td>Pwd write</td><td>0/1</td></tr>
<tr><td>8</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>9</td><td rowspan="2">U4-Pass User</td><td>Pwd write</td><td>0/1</td></tr>
<tr><td>10</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>11</td><td rowspan="2">U3-Pass User</td><td>Pwd write</td><td>0/1</td></tr>
<tr><td>12</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>13</td><td rowspan="2">U2-Pass User</td><td>Pwd write</td><td>0/1</td></tr>
<tr><td>14</td><td>Perma lock</td><td>0/1</td></tr>
<tr><td>15</td><td rowspan="2">U1-Pass User</td><td>Pwd write</td><td>0/1</td></tr>
<tr><td>16</td><td>Perma lock</td><td>0/1</td></tr>
</table>
Values are specified by "Block Lock" command.</td></tr>
</table>

CHECK! Secure function is supported by certificication number at 001AHB1004, 001PVAB1002. The reader which certification number is 001AHB1001 can not use this function. Also Secure function can only use for the RF tags which supports secure RFID protocol. The standard EPC global Class1 Generation 2 RF tags does not work.

# Set Attenuat (SATT)

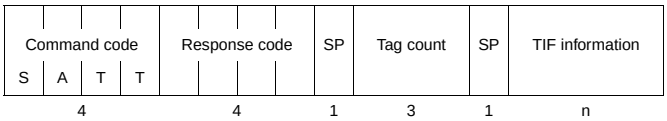
## ■ Command Format




| Item | Description |
|---|---|
| Level | 0: Level 0 (zero)<br>1-6: RFU<br>7: Level 1 |
| Lock | 0: Level value is not controlled with lock.<br>1: Level value is set unchangeable permanently. |

| Option code | Description | Available Optional Value |
|---|---|---|
| -seq | Communication sequence | SOC: Single Once |
| -ant | Number of antenna | Specifies order of antenna operation with figure 1-4; max 9 characters.<br>The figure 1 to 4 is antenna's identical number. |
| -tmo | Process time out(msec) | 0, or from 10 to 2550 in 10msec increments (in DRM off)<br>0, or from 10 to 10000 in 10msec increments (in DRM on) |
| -tif | Additional tag information | Additional information responded with data<br>ANT: antenna number<br>CNT: count of read tags<br>EPC: EPC code<br>PEP: PC bits and EPC code<br>PER: PC bits, EPC code and CRC<br>Refer to the *Option Details* in detail.<br>*p. 73* |
| -pwd | Access password | Specifies a password with 8-digit hex number (32-bit word).<br>It is essential unless the value in the area of tag Access Password is zero. |
| -ptc | Tag protocol | 1 (Gen2) |

## ■ Response Format

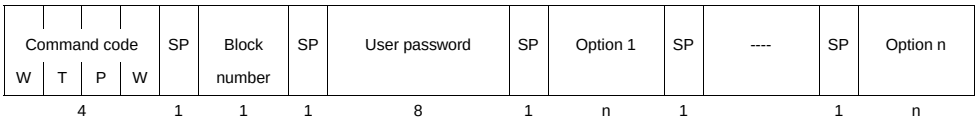



| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Tag count | Count of written tag(s) |
| TIF information | Tif information specified with command.<br>Each optional value for tif information lines with comma separation. |

CHECK! Secure function is supported by certificication number at 001AHB1004, 001PVAB1002. The reader which certification number is 001AHB1001 can not use this function. Also Secure function can only use for the RF tags which supports secure RFID protocol. The standard EPC global Class1 Generation 2 RF tags does not work.

# Write Password (WTPW)

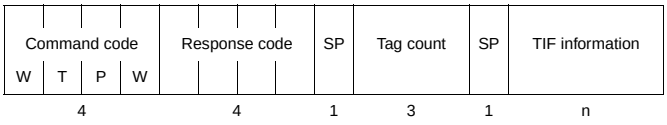
## ■ Command Format




| Item | Description |
|---|---|
| Block number | Specifies memory address of the targeted area in the user memory; 1-5. |
| User password | Specifies password for each user area.The password should be same as the password set previously in the password area corresponding to the block number set above. |

| Option code | Description | Available Optional Value |
|---|---|---|
| -seq | Communication sequence | SOC: Single Once |
| -ant | Number of antenna | Specifies order of antenna operation with figure 1-4; max 9 characters. |
| -tmo | Process time out (msec) | 0, or from 10 to 2550 in 10msec increments (in DRM off)<br>0, or from 10 to 10000 in 10msec increments (in DRM on) |
| -tif | Additional tag information | Additional information responded with data<br>ANT: antenna number<br>CNT: count of read tags<br>EPC: EPC code<br>PEP: PC bits and EPC code<br>PER: PC bits, EPC code and CRC<br>Refer to the *Option Details* in detail.<br>*p. 73* |
| -ptc | Tag protocol | 1 (Gen2) |

## ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Tag count | Count of written tag(s) |
| TIF information | Tif information specified with command.<br>Each optional value for tif information lines with comma separation. |

CHECK! Secure function is supported by certificication number at 001AHB1004, 001PVAB1002. The reader which certification number is 001AHB1001 can not use this function. Also Secure function can only use for the RF tags which supports secure RFID protocol. The standard EPC global Class1 Generation 2 RF tags does not work.

# Setting Command

To set the Reader Status and Reader Settings, following items shall be specified in the SET Reader command (SETR) and GET Reader command (GETR). The Reader Status is available only for reading data.

## Function condition setting of Reader/Writer

### ■ Parameter that can be specified by GETR (Peculiar information on Reader, Connected state of Antenna, Elapsed time)

| Code | Name | Description | Fixe Value |
|---|---|---|---|
| MFT | Manufacturer | Manufacturer name is read. | “OMRON Corporation“ |
| TYP | Type of the reader | Product form is read. | “V750-BA50C04-US“ |
| FWV | Firmware version | Version of the firmware is read. | XXX-XXX-XXX-X<br>SH-MB-FP-CA-Hardware level |
| SER | Serial number | Production number is read. | “XXXXXXXX” |
| MAC | MAC address | MAC address is read. | 00:00:0A:89:XX:XX |
| ATS | Antenna status<br>(Connected Antenna) | The number of the connected antenna is read.<br>ex. Antenna #1, Anntena #3 and Antenna #4 are connected: 134 | |
| TTK | Transition time from kick | Time (hh:mm:ss) (max: 9999:59:59)<br>ex. Passage of 34 seconds for 12 minutes: 00:12:34 | Transition time |
| OPT | Option number | The number of the optional feature that can be used is read. | Option number<br>(comma separated values) |

* Support is provided for the firmware version 103-103-104-0 or later.

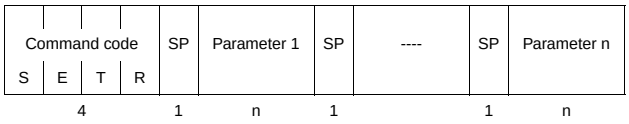
### ■ Parameter that can be specified by SETR and GETR

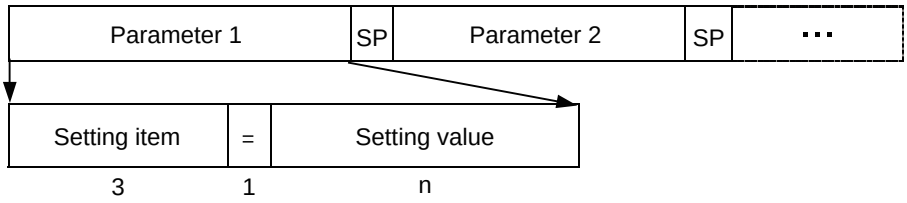
| Code | Name | Description | Factory setting |
|---|---|---|---|
| Reader Infomation | | | |
| RNM | Reader name | Name of user definition. (max: 63 characters, ASCII) | (None) |
| RRL | Reader’s role | Name of user definition. (max: 63 characters, ASCII) | (None) |
| Ethernet | | | |
| PRT | TCP/IP Port | Port number of use.<br>2 ports are used; specified port (command control) and specified port +1(Web Function). | 7090 |
| LHN | Host Name | Name on the network. (max: 63 characters, ASCII)<br>Sent to DHCP server when IP is acquired. | “V750-BA50C04-US“ |
| LDN | Domain Name | Network domain name. (max: 67 characters, ASCII)<br>Sent to DHCP server when IP is acquired. | (None) |
| DHE | DHCP Enable | 0: Disable<br>1: Enable | 0: Disable |
| LIP | LAN IP Address | IP address when using static network settings. | 192. 168. 1. 200 |
| LNM | LAN Net Mask | Subnet mask when using static IP address. | 255. 255. 255. 0 |
| LGW | Default Gateway | Default gateway when using static IP address. | 192. 168. 1 .254 |
| RS-232C | | | |
| RBR | RS-232C baud rate | 9600/19200/38400/57600 (bps) | 57600 |
| RDT | RS-232C data length | 7: 7 bit<br>8: 8 bit | 7: 7 bit |
| RPB | RS-232C parity bit | N: none / O: odd / E: even | E: even |
| RSB | RS-232C stop bit | 1: 1 Stop bit<br>2: 2 Stop bit | 2: 2 stop bit |

## ■ Set Reader function (SETR)

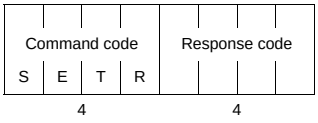
This command writes the functional conditions of the command in process into the nonvolatile memory in the reader. The setting shall be enabled at the upcoming startup.

### • Command Format




| Item | Description |
|---|---|
| Parameter |  Setting value is connected by the equal sign(=) and specified the set item.<br>Refer to the *Function condition setting of Reader/Writer* for details of a set item.<br>*p. 101* |

### • Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |

## • Command/Response Example

Set Reader function (SETR)

| | |
|---|---|
| Command | *SETR(S)Param1=Value1(S)...(S)ParamN=ValueN<LF>*<br>(S): Space code<br>param: Setting value is connected by equal sign (=) and specified. |
| Response | *SETR[RC]<LF>*<br>[RC]: Response Code |

Example 1) When DHCP Enabled is set "ON":

*[Tx] SETR dhe=1<LF>*

*[Rx] SETR0000<LF>*

Example 2) When [Host name; V750-BA50C04, IP; 192.168.1.1, and Subnet mask; 255.255.255.0] is set:

*[Tx] SETR lhn="V750-BA50C04" lip=192.168.1.1 lnm=255.255.255.0<LF>*

*[Rx] SETR0000<LF>*

Example 3) When [RS-232C Baud rate; 19200bps, Data length; 7bit, Parity; Even,Stop; 1bit] is set:

*[Tx] SETR rbr=19200 rdt=7 rpb=E rsb=1<LF>*

*[Rx] SETR0000<LF>*

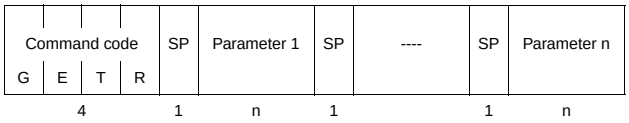
Example 4) When the setting parameter is incorrect:

*[Tx] SETR abc=111<LF>*

*[Rx] SETR1421<LF>*

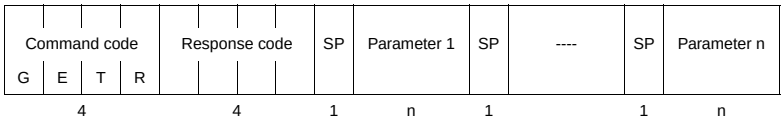
## ■ Get Reader (GETR)

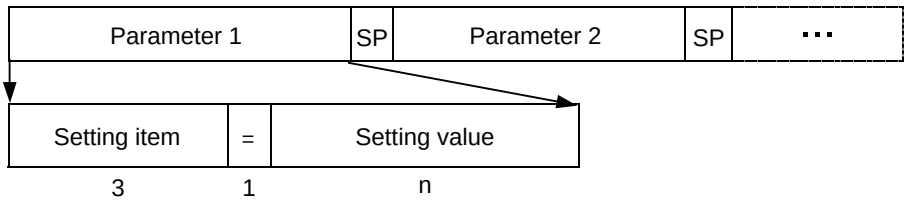
### • Command Format




| Item | Description |
|---|---|
| Parameter | Referred Setting value and Setting item are specified.<br>Refer to the *Function condition setting of Reader/Writer* for details of setting item.<br>*p. 101* |

### • Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Parameter |  <br><br>Setting value is connected by the equal sign(=) and specified the set item.<br>Refer to the *Function condition setting of Reader/Writer* for details of a set item.<br>*p. 101* |

## • Command/Response Example

Get Reader (GETR)

| | |
|---|---|
| Command | *GETR(S)Param1=Value1(S)...(S)ParamN=ValueN<LF>*<br>(S): Space code<br>param: Setting item is specified by the sign. |
| Response | *GETR[RC](S)param1=value1(S)..<LF>*<br>[RC]: Response Code<br>(S): Space code<br>param: Setting item is set by the sign.<br>value: Setting value is connected by equal sign (=) and specified.<br>Note: If the setting value includes any space, the space shall be enclosed with double quotation. |

Example 1) When [Firmware version;100-100-100-0] is read:

*[Tx] GETR fwv<LF>*

*[Rx] GETR0000 fwv=100-100-100-0<LF>*

Example 2) When [Host name; V750-BA50C04, IP; 192.168.1.1, and Subnet mask; 255.255.255.0] is read:

*[Tx] GETR lhn lip lnm<LF>*

*[Rx] GETR0000 lhn="V750-BA50C04" lip=192.168.1.1 lnm=255.255.255.0 <LF>*

Example 3) When [RS-232C Baud rate; 19200bps, Data length; 7 bits, Parity; even, and Stop; 1bit] is read:

*[Tx] GETR rbr rdt rpb rsb<LF>*

*[Rx] GETR0000 rbr=19200 rdt=7 rpb=E rsb=1<LF>*

# Operation Setting

Specifying following option in the operation setting command (SETO) or operation read command (GETO) enables to set or read the reader's operation settings.

Operation setting

| Code | Name | Description | Factory setting |
|---|---|---|---|
| Command Entry | | | |
| RIF | Response Interface | It specifies make a response after the registration command is executed replying ahead.<br>0: None<br>1: Ethernet<br>2: RS-232C | 1: Ethernet |
| IEC | Initial Executed Command | Format: *Function(S)"Command"*<br>(S): Spase code<br><br>Function (One digit)<br>0: unregistered<br>1: execute command<br><br>"Command"<br>Command to be execute<br><br>ex. *"RDID -seq SOC -tmo 500"*<br>- Max: 255 characters, ASCII<br>- Note: This setting value has double quotation marks. | (None) |
| Command Entry | | | |
| IN1 | Input port #1 function setting | Format: *Function(S)Timing(S)"Command"*<br><br>Function (One digit)<br>0: None<br>1: Command execution<br><br>Timing (One digit)<br>0: Startup (Fixed)<br><br>"Command"<br>Command to be execute<br><br>ex. *"RDID -seq SOC -tmo 500"*<br>- Max: 255 characters, ASCII<br>- Note: This setting value has double quotation marks.<br>- Note: Only when the Function is specified with "1", set the Timing and the "Command".When the Function is specified with "0", executed "Command" data is saved and response data is returned. | (None) |
| IN2 | Input port #2 function setting | Same as IN1 | (None) |
| IN3 | Input port #3 function setting | Same as IN1 | (None) |
| IN4 | Input port #4 function setting | Same as IN1 | (None) |

| Code | Name | Description | Factory setting |
|---|---|---|---|
| Programmable Output | | | |
| OT1 | Output port #1 function setting | Format: *Timing(S)OutputTime(S)Condition*<br><br>Timing (One digit)<br>00:None<br>(User input)<br>11:RUN output<br>(The reader is running normally.)<br>12:ERR output<br>(The reader stopped with error.)<br>20:COM output<br>(The reader is communicating.)<br>2n:ATn Current antenna(s) (n=1 to 4)<br>(The reader is communicating with specified antenna)<br>31:NML<br>(Evaluated normal completion)<br>32:ERC<br>(Evaluated completion with error occurring)<br><br>OutputTime<br>10 to 9990 [ms]<br>0 (Status kept until upcoming evaluation.)<br>- Note: Output time is effective only for NML/ ERC setting.<br><br>Condition<br>- Note: Output time is effective only for NML/ ERC setting.<br>- Note: If the condition is omitted, output signal shall be on without condition.<br><br>* Refer to the following list. | (None) |
| OT2 | Output port #2 function setting | Same as OT1 | (None) |
| OT3 | Output port #3 function setting | Same as OT1 | (None) |
| OT4 | Output port #4 function setting | Same as OT1 | (None) |

The format of status judgment expression

1) If the NML mode is specified in output function setting, you can set conditions by using the following format.

| | | |
|---|---|---|
| Condition A<br>Condition B | Comparison symbol data | "DAT": data to be read<br>"TCT": tag count to be read |
| | Comparison operators | (1) When comparison symbol data is "DAT":<br>"==": Left side data is equal to right side data.<br>"!=": Left side data is not equal to right side data.<br>(2) When comparison symbol data is "TCT":<br>"==": Left side data is equal to right side data.<br>"!=": Left side data is not equal to right side data.<br>">=": Left side data is bigger than right side data.<br>"<=": Left side data is smaller than right side data. |
| | Comparison data | (1) When comparison symbol data is "DAT":<br>XXXX... [Hex] (X: 0 to 9 , A to F)<br>• "*" mark is a wild card<br>• When the data length is different, the result shall be incorrect.<br>• When the command has -tif option, comparison symbol data "DAT" has all tag information that the reader read.<br>• When comparison symbol data is ",", specify with "*" mark.<br>(2) When comparison symbol data is "TCT":0 to 999 |
| Logical operator | | "&": AND operator<br>Format: condition A & condition B<br>"\|": OR operator<br>Format: condition A \| condition B |

* If there is no condition to be set, the output signal shall be on after normal end.
* If there is no condition to be set or condition (A) is set, condition (B) shall not be included in the setting.

Ex.) When the read data is 12bytes (24character) and the characters from 5th to 8th in it is "0000" or when the number of tags is 8 or more:

*"DAT==****0000**********|TCT>=8"*

2) If the ERC mode is specified for output function setting, you can set conditions with the following format.

| | | |
|---|---|---|
| Condition | Comparison symbol data | "DAT": error code<br>(Two characters from the head in error code.)<br>- "TCT" is not supported. |
| | Comparison operators | "==": matched<br>When the error code is in specified error code list:<br>"!=": unmatched<br>When the error code is not in specified error code list: |
| | Comparison data | It specifies error codes for comparison in series.<br>(Max 6 error code can be specified.)<br>*ex. "7071"•••* |

* If there is no condition to be set, the output signal shall be on after normal end.

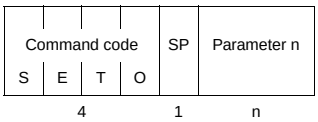
Ex.) When communication error (Error code is 70xx) or verify error (Error code is 71xx) has been occurred:

*"DAT ==7071"*

## ■ Set Operation (SETO)

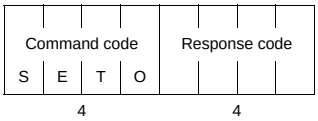
This command is to write operation conditions into the nonvolatile memories in the reader. The new setting shall be enabled at the upcoming startup.

### • Command Format




| Item | Description |
|---|---|
| Parameter | Setting item \| = \| Setting value<br>3 1 n<br>Setting value is connected by the equal sign(=) and specified the set item.<br>Refer to the *Operation Setting* for details of setting item.<br>*p. 106* |

### • Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |

## • Command/Response Example

Set Operation (SETO)

| | |
|---|---|
| Command | *SETO(S)param=value<LF>*<br>(S): Space code<br>param: Setting item is specified by the sign.<br>value: Setting value is connected by equal sign (=) and specified. |
| Response | *SETO[RC]<LF>*<br>[RC]: Response Code |

Example 1) When the Response I/F after command execution is set RS-232C:

*[Tx] SETO rif=2<LF>*

*[Rx] SETO0000<LF>*

Example 2) When the executed command at the start up is set as ["RDID -ant 122322 -tmo 100"]:

*[Tx] SETO iec=1 "RDID -ant 122322 -tmo 100"<LF>*

*[Rx] SETO0000<LF>*

Example 3) When Input 1 function setting is set as [Command execution, start up edge, "RDID -ant 122322 -tmo 100"] :

*[Tx] SETO in1=1 0 "RDID -ant 122322 -tmo 100"<LF>*

*[Rx] SETO0000<LF>*

Example 4) When output 3 function setting is set as [Signal is on for 2 seconds] when the executed command is finished normally, the read data is 12bytes(24characters) and the 5th to 8th data is "0000":

*[Tx] SETO ot3=31 2000 dat==****0000**********<LF>*

*[Rx] SETO0000<LF>*

Example 5) When output 4 function setting is set as[Signal is on for 1 second] if tag count is 10 or less:

*[Tx] SETO ot4=31 1000 TCT<=10<LF>*

*[Rx] SETO0000<LF>*

Example 6) When output 2 function setting is set as [Signal is on for 1 second] if both conditions on example 5 and 6 are fulfilled:

*[Tx] SETO ot2=31 1000 DAT==****0000**********&TCT<=10<LF>*

*[Rx] SETO0000<LF>*

Example 7) When output 2 function setting is set [Signal keep on when ERC(Communication error)]:

*[Tx] SETO ot2=32 0<LF>*

*[Rx] SETO0000<LF>*

Example 8) When output 2 function setting is set as [Signal is on for 2 seconds] if any code error of 71xx, 72xx or 7Axx is occurred:

*[Tx] SETO ot2=32 2000 71727A<LF>*

*[Rx] SETO0000<LF>*

Example 9) When output 1 function setting is deleted:

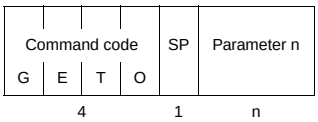
*[Tx] SETO ot1=00<LF>*

*[Rx] SETO0000<LF>*

## ■ Get Operation (GETO)

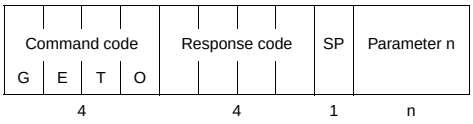
This command allows the reader to read the current operation conditions. Even after setting operation command (SETO) is executed, the old information shall be read out unless the reboot is completed.

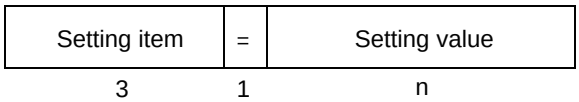
### • Command Format




| Item | Description |
|---|---|
| Parameter | Parameter can be specified only by one item.<br>Referred Setting value and Setting item are specified.<br>Refer to the *Operation Setting* for details of setting item.<br>*p. 106* |

### • Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Parameter |  <br>Setting value is connected by the equal sign(=) and specified the set item.<br>Refer to the *Operation Setting* for details of setting item.<br>*p. 106* |

## • Command/Response Example

Get Operation (GETO)

| | |
|---|---|
| Command | *GETO(S)param<LF>*<br>(S): Space code<br>param: Setting item is specified by the sign. |
| Response | *GETO[RC](S)param=value<LF>*<br>[RC]: Response Code<br>(S): Space code<br>param: Setting item is specified by the sign.<br>value: Setting value is connected by equal sign (=) and specified.<br>Note: If the setting value includes any space, the space shall be enclosed with double quotation. |

Example 1) When executed command is read at startup:

*[Tx] GETO iec<LF>*

*[Rx] GETO0000 iec=1 "RDID -ant 122322 -tmo 100"<LF>*

Example 2) When Input 2 function setting is never registered:

*[Tx] GETO in2<LF>*

*[Rx] GETO0000 in2=0 0<LF>*

Example 3) When Input 1 function setting is read:

*[Tx] GETO in1<LF>*

*[Rx] GETO0000 in1=1 0 "RDID -ant 122322 -tmo 100"<LF>*

Example 4) When Input 3 function setting is read but the setting is not alive:

*[Tx] GETO in3<LF>*

*[Rx] GETO0000 in3=0 0 "RDID -seq MOC -ant 123"<LF>*

Example 5) When Output 4 function setting is never registered:

*[Tx] GETO ot4<LF>*

*[Rx] GETO0000 ot4=00 0<LF>*

Example 6) When Output 1 function setting is read:

*[Tx] GETO ot1<LF>*

*[Rx] GETO0000 ot1=31 2000 DAT==****0000**********<LF>*

Example 7) When Output 2 function setting is read and the setting is not alive:

*[Tx] GETO ot2<LF>*

*[Rx] GETO0000 ot2=00 2000 DAT==****0000**********<LF>*

## Communication Settings

To set the conditions to communicate with tags, following items shall be specified in the SET Communication command (SETC) and GET Communication command (GETC). Specifying following option allows the reader to set or read the communication condition. To write the setting data into the nonvolatile memories in the reader, SAVE command (SAVE) shall be executed.

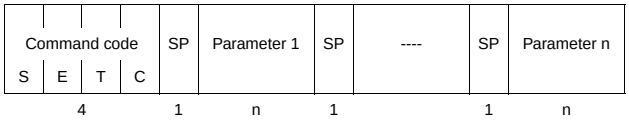
| Code | Name | Description | Factory setting |
|---|---|---|---|
| RF Control | | | |
| SS1 | Gen2 Session value #1<br>In case of Once Mode sequence<br>(Gen2)Session-Once | Session value of SOC/MOC sequence<br>0/1/2/3<br>Refer to the *Session Setting* for details of Session.<br>*p. 46* | 0 |
| SS2 | Gen2 Session value #2<br>In case of Repeat Mode sequence<br>(Gen2)Session-Repeat | Session value of SRP/MRP sequence<br>0/1/2/3<br>Refer to the *Session Setting* for details of Session.<br>*p. 46* | 2 |
| PW1 | UHF power level at port #1 | The output value of the antenna is set. | 31.5 (dBm) |
| PW2 | UHF power level at port #2 | Same as PW1 | 31.5 (dBm) |
| PW3 | UHF power level at port #3 | Same as PW1 | 31.5 (dBm) |
| PW4 | UHF power level at port #4 | Same as PW1 | 31.5 (dBm) |
| CMD | Communication mode | Baud rate from tag is set.<br>0: Normal mode<br>1: Dense reader mode (DRM) | 0: Normal mode |
| EWL | EPC word length | EPC word length (total word length of PC+EPC) of tag for the communication is specified.<br>Refer to the *Gen2 Tags Memory Map* for details<br>*p. 32*<br>0: Auto mode<br>1 to 32: Fixed length mode<br>Auto mode judges the EPC word length from the automatic operation while communicating with tag. | 0: Auto mode |
| Filtering | | | |
| FTE | Filtering enable | 0: None<br>1: Filter1 only<br>2: Filter2 only<br>1&2: Filter1 and Filter2<br>1\|2: Filter1 or Filter2 | 0: None |
| FT1 | Filtering bondition #1 | Format:<br>FileterType(S)MemBank(S)Pointer(S)Length(S)Value<br>FilterType: 0 (fixed)<br>MemBank: 0 to 3<br>Pointer: 0 to 9999 (bit) *1<br>Length: 1 to 255(bit)<br>Value: XXXX...<br>Set longer bits than the bits specified in the "Length" with 2-digit hexadecimal number ("0" to "F"). Max: 64 characters. The most significant bit is a Pointer of the Value. | (None) |
| FT2 | Filtering bondition #1 | Same as FT1 | (None) |
| Smoothing | | | |
| SBF | Prevents repeat read<br>(Smoothing buffer size) | Buffer Size is set.<br>0: Disable<br>1 to 999: Enable (Buffer Size) | 0: Disable |
| ONR | Omit no tag response | 0: Disable<br>1: Enable | 0: Disable |

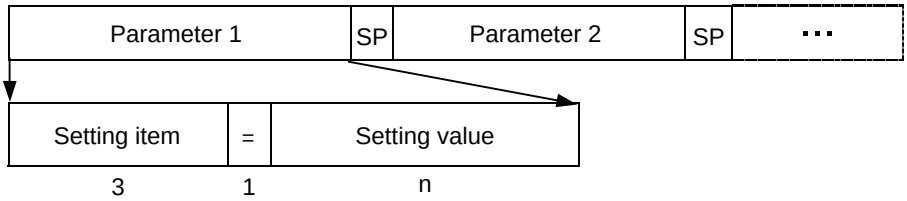
*1 In firmware versions earlier than 103-104-103-0, the programmable range is 0 to 255(bit).

## ■ Set Communication (SETC)

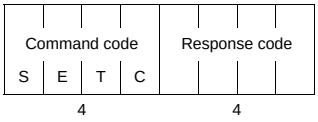
This command writes the communication settings in the reader. While the command is being executed, setting conditions in the reader are changed. To write the setting data into the nonvolatile memories in the reader, SAVE command (SAVE) shall be executed. The new setting shall be enabled at the upcoming startup.

### • Command Format




| Item | Description |
|---|---|
| Parameter |  Setting value is connected by the equal sign(=) and specified the set item.<br>Refer to the *Function condition setting of Reader/Writer* for details of a set item.<br>*p. 101* |

### • Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |

## • Command/Response Example

Set Communication (SETC)

| | |
|---|---|
| Command | *SETR(S)Param1=Value1(S)...(S)ParamN=ValueN<LF>*<br>(S): Space code<br>param: Setting value is connected by equal sign (=) and specified.<br>value: Setting value is connected by equal sign (=) and specified.<br>Note:<br>• It specifies a parameter connecting a setting item to a setting value. ('The setting item does not have to be prepended with ' -' .)<br>• No space shall be put in from the beginning of the setting item to the end of the setting value unless setting item is ft1 or ft2.<br>•If you specify ft1 and ft2 for filtering, set ft1, ft2 and fte at one sequent action. ft1 and ft2 shall be always followed by Filtering Enable (fte). If you specify them in one command SETC, firstly put ft1 and ft2 then fte in order. If you change the filtering conditions with ft1 and/or ft2, the filtering function will be temporarily Disabled.<br>• If the setting item is ft1 or ft2, the five items shall be specified with space separation between each item. Instead of space, enclosing double quotations is not allowable.<br>• In a single command, multiple setting items can be specified by separating with space. 2 or more character spaces are acceptable for indicating separation. |
| Response | *SETC[RC]<LF>*<br>[RC]: Response Code |

Example 1) When [Antenna port #1 power; 22.5, Gen2 session for Once Mode Reading; 1] is specified:

*[Tx] SETC pw1=22.5 ss1=1<LF>*

*[Rx] SETC0000<LF>*

Example 2) When [Filter; 1 or 2, Filter1's Bank; 1, Pointer; 32, Length; 2, Data; C0(11b), Filter2's Bank 1, Pointer; 64, Length;16 ,Data; 125A(00010010 01011010b)] is specified:

*[Tx] SETC ft1=0 1 32 2 C0<LF>*

*[Rx] SETC0000<LF>*

*[Tx] SETC ft2=0 1 64 16 125A<LF>*

*[Rx] SETC0000<LF>*

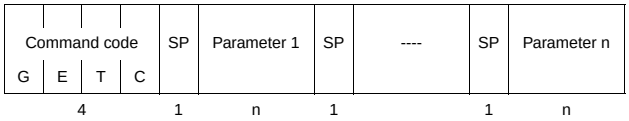
*[Tx] SETC fte=1|2<LF>*

*[Rx] SETC0000<LF>*

## ■ Get Communication (GETC)

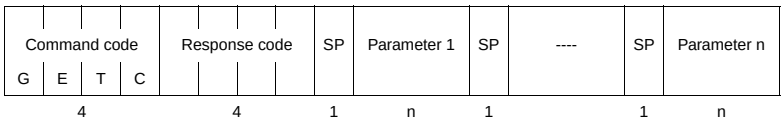
This command allows the reader to read the current communication conditions. Just after SET Communication command (SETC) is executed, new information shall be read out.

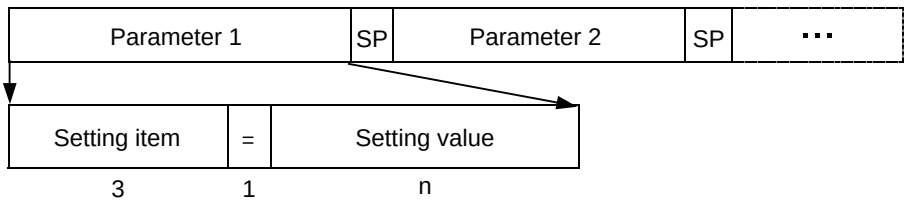
### • Command Format




| Item | Description |
|---|---|
| Parameter | Referred Setting value and Setting item are specified.<br>Refer to the *Function condition setting of Reader/Writer* for details of setting item.<br>*p. 101* |

### • Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Parameter |  <br><br>Setting value is connected by the equal sign(=) and specified the set item.<br>Refer to the *Function condition setting of Reader/Writer* for details of a set item.<br>*p. 101* |

## • Command/Response Example

Get Communication (GETC)

| | |
|---|---|
| Command | *GETC(S)Param1=Value1(S)...(S)ParamN=ValueN<LF>*<br>(S): Space code<br>param: Setting item is specified by the sign. |
| Response | *GETC[RC](S)[Param1=Value1](S)..(S)[ParamN=ValueN]<LF>*<br>[RC]: Response Code<br>[ParamN=ValueN]: Setting item and value<br>(S): Space code<br>param: Setting item is set by the sign.<br>value: Setting value is connected by equal sign (=) and specified.<br>• If multiple items are specified, the reader shall return response with connecting specified items to the setting values with equal in the specified order. Alphabetical characters included in the item name in the response shall be small characters.<br>• If the setting item is ft1 or ft2, the five items shall be returned with space separation between each item. Double quotations shall not be used for enclosing. |

Example 1) When [Antenna port #1 UHF power, Gen2 session value for Once Mode Reading] is read out:

*[Tx] GETC pw1 ss1<LF>*

*[Rx] GETC0000 pw1=10 ss1=1<LF>*

Example 2) When [Filter setting, Filter condition 1, Filter condition 2] is read out:

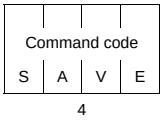
*[Tx] GETC fte ft1 ft2<LF>*

*[Rx] GETC0000 fte=1&2 ft1=0 1 8 2 C0 ft2=0 1 20 16 125A<LF>*

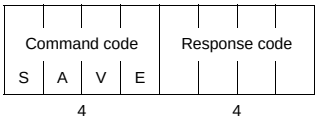
## ■ Save communication setting (SAVE)

This command allows the reader to write communication setting into the nonvolatile memories in the reader. If SET Communication command (SETC) is executed and then the reader is started up without executing this command (SAVE), new setting will be abandoned.

### • Command Format




### • Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |

### • Command/Response Example

Get Communication (GETC)

| | |
|---|---|
| Command | *SAVE <LF>* |
| Response | *SAVE[RC]<LF>*<br>[RC]: Response Code |

Example 1) When communication setting is saved (New setting is written into the nonvolatile memory):

*[Tx] SAVE<LF>*

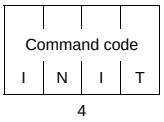
*[Rx] SAVE0000<LF>*

# Control Command

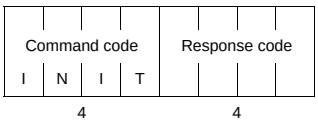
## Initialize setting (INIT)

This command initializes all setting of reader to the factory default setting. All settings shall be written into the inner nonvolatile memories. After executing this INIT command, the reader requires reboot.

### ■ Command Format




### ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |

### ■ Command/Response Example

Initialize setting (INIT)

| | |
|---|---|
| Command | *INIT<LF>* |
| Response | *INIT[RC]<LF>*<br>[RC]: Response Code |

Example 1) All setting of reader is initialized to the factory default setting:

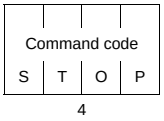
*[Tx] INIT<LF>*

*[Rx] INIT0000<LF>*

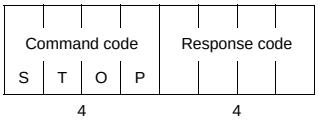
# Stop the repeating operation (STOP)

This command instructs the reader to stop the operation in process.

## ■ Command Format




## ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |

## ■ Command/Response Example

Initialize setting (INIT)

| | |
|---|---|
| Command | *STOP<LF>* |
| Response | *STOP[RC]<LF>*<br>[RC]: Response Code |

* The communication process is not running in the reader, the error is returned [Code: 1500].

Example 1) When the reader stops multi-repeat communication:

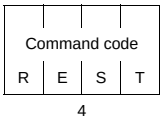
*[Tx] RDID -seq MRP -ant 12 ---- Read ID command is started under multi-repeat mode.*

*[Tx] STOP<LF>*
*[Rx] STOP0000<LF>*

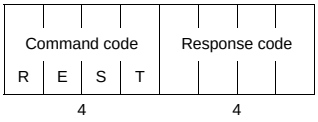
# Reset (RSET)

This command reboots the reader after the reader returns the response that the command has received. When it is connected via Ethernet, it is disconnect the network connection before rebooting.

## ■ Command Format




## ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |

## ■ Command/Response Example

Initialize setting (INIT)

| | |
|---|---|
| Command | *REST<LF>* |
| Response | *REST[RC]<LF>*<br>[RC]: Response Code |

Example 1) Reboot the reader:

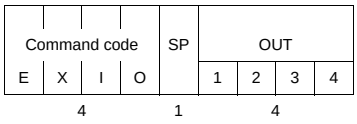
*[Tx] REST<LF>*

*[Rx] REST0000<LF>*

# External Input Output control (EXIO)

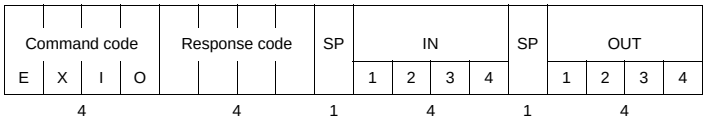
This command allows the reader to output ON/OFF to the output terminal and read an input terminal status. If output port(s) is connected to the device(s) that is not used for general purpose, the reader ignores ON/OFF output for the port(s). If output setting value is omitted, the reader shall read the input and output status.

## ■ Command Format




| Item | Description |
|---|---|
| OUT1 to 4 | The output signal of OUT1 to 4 is set.<br>0: OFF, 1: ON, *:<br>It is possible to omit (The output change of OUT is not done when omitting it). |

## ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| IN | State of IN1 to 4<br>0: OFF, 1: ON |
| OUT | State of OUT1 to 4<br>0: OFF, 1: ON |

## ■ Command/Response Example

External Input Output control (EXIO)

| | |
|---|---|
| Command | *EXIO<LF>* (For input/output port status read)<br>*EXIO(S)OutputSignal<LF>* (For output status specifying)<br>(S): Space code<br>OutputSignal: For OUT1-4, values are set with four characters (left to the right; 1-4)<br>(0:OFF / 1:ON / *:Don't care) |
| Response | *EXIO[RC](S)[InputSignal](S)[OutputSignal]<LF>*<br>[RC]: Response Code 0000: Fixed<br>(S): Space code<br>[InputSignal]: For IN1-4, signal values 0 or 1 are set with four characters (left to the right).<br>[OutputSignal]: For OUT1-4, signal values 0 or 1 are set with four characters (left to the right).<br>(0:OFF / 1:ON) |

Example 1) When [Output 1; High, Output 2; Low, Output 3; High, Output 4; Low] is specified:

*[Tx] EXIO 1010*

*[Rx] EXIO0000 1111 1010*

Example 2) When [Getting I/O status] is specified:

*[Tx] EXIO<LF>*

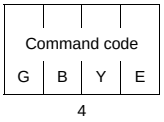
*[Rx] EXIO0000 1011 1001<LF>*

(From the left side, the following status is shown; IN1...IN4, OUT1...OUT4)

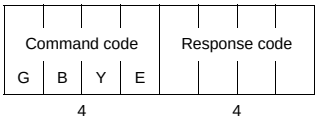
# Good Bye (GBYE)

This command enables to shut down connection with Ethernet. After the reader received the command, it returns the response that the command has received. And the network connection is disconnected after 1 second.

## ■ Command Format




## ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |

## ■ Command/Response Example

Good Bye (GBYE)

| | |
|---|---|
| Command | *GBYE<LF>* |
| Response | *GBYE[RC]<LF>*<br>[RC]: Response Code |

Example 1) Disconnect the Ethernet connection between host and the reader.

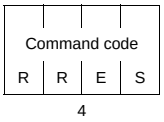
*[Tx] GBYE<LF>*

*[Rx] GBYE0000<LF>*

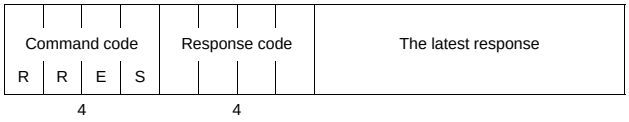
# Request Resend (RRES)

This command instructs the reader to re-send the latest response data that has been sent. This command shall not be accepted when the other command such as Repeat mode is being processed.

## ■ Command Format




## ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Response data immediately before | The response data that replies immediately before is set. |

## ■ Command/Response Example

Request Resend (RRES)

| | |
|---|---|
| Command | *RRES<LF>* |
| Response | The latest response |

* If there is no the latest response data, the error is returned [Code:1500].
* When the communication mode is SRP/MRP, it can be accepted. But if the timeout value is so small that the reader may not identify various responses returned continuously.

Example 1) When the host requests to resend the response for the successful single ID read command (RDID -seq SOC -ant 1 -tif EPC,ANT) that has been executed most lately:

*[Tx] RRES<LF>*

*[Rx] RDID0000 001 FFFFEEEEDDDD8CE2BBBB1073,1<LF>*

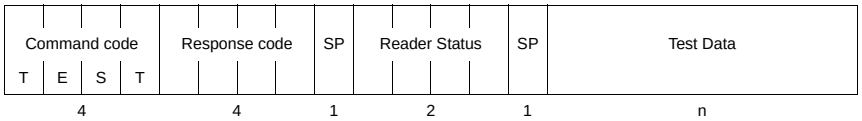
# Test System (TEST)

This command instructs the reader to return the reader status data and the exact data message just after receiving it from the host. It is to test a communication line and to get reader status.

## ■ Command Format

| Item | Description |
|---|---|
| Test Data | The test data that turns is set. |

## ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Reader Status | The reader writer's operation is shown.<br>00: Stand-by state, 10: Communication processing,<br>3X: Setting value error, 4X: System error, 90: Safe mode |
| Test Data | The test data that turns is set. |

## ■ Command/Response Example

Test System (TEST)

| | |
|---|---|
| Command | *TEST(S) TestData<LF>*<br>TestData: Given string |
| Response | *TEST[RC](S)[ReaderStatus](S)[TestData]<LF>*<br>[RC]: Response Code<br>[ReaderStatus]: Reader's status code<br>00:Waiting for command<br>10:Communicating<br>3x:Setting error<br>4x:System error<br>90:Running on Safe Mode<br>[TestData]: Same data as command parameter |

Example 1) When test data "uhf rfid" is entered to check a communication status between the host and the reader:

*[Tx] TEST uhf rfid<LF>*

*[Rx] TEST0000 00 uhf rfid <LF>*

Example 2) The reader's status check:

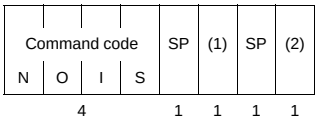
*[Tx] TEST<LF>*

*[Rx] TEST0000 00<LF>*

# Noise monitoring (NOIS)

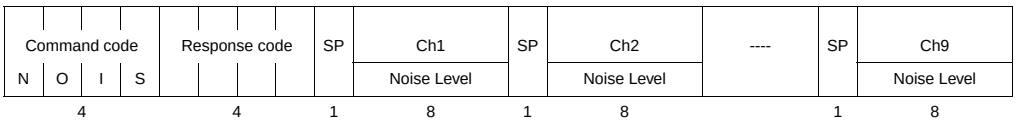
This command is to check the noise level of the specified antenna.

## ■ Command Format




| Item | Description |
|---|---|
| (1) Noise level measurement mode | Noise level measurement mode<br>0: fixed |
| (2) Antenna port number | The number of the antenna port where the noise level measurement is set. |

## ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |
| Ch1 | Noise level of each channel.<br>The noise level of one channel is displayed by eight digits.<br>XXXXXXXX: The larger the value is, the higher the noise level is.<br><br>When the value at the noise level is converted dBm, it is possible to convert it by the following expression.<br>20 Log(10)(Noise Level) → 135[dBm]<br>* This conversion is a standard. Therefore, it uses it as a rough estimate. |

## ■ Command/Response Example

Noise level check (NOIS)

| | |
|---|---|
| Command | *NOIS(S)Mode(S)Antenna<LF>*<br>(S): Space code<br>Mode: noise level measurement mode (0: fixed)<br>Antenna: the port number of antenna (1-4) that is to check the noise level. |
| Response | *NOIS[RC](S)[ch1 and ch2](S)[ch3 and ch4](S)•••(S)[ch49 and ch50]<LF>*<br>[RC]: Response Code<br>(S): Space code<br>[ch1 and ch2] to [ch49 and ch50]: Noise level of each communication channel.<br>*The response data has a noise level every 2channels(1MHz band,1ch and 2ch, 3ch and 4ch, ...,49ch and 50ch).<br>*1ch means 902.75MHz, 2ch means 903.25MHz, 3ch means 903.75MHz, ..., 50ch means 927.25MHz |

* To convert the response data to dBm, put them into the following formula;
20 log10 (response value) - 135. (The derived value should be used only as a guide.)

Example 1) Noise level check for the antenna port 1:

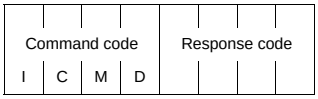
*[Tx] NOIS 0 1<LF>*

*[Rx] NOIS0000 0000032A 00000345 000003B9 000003E0 ... 00000339<LF>*

# Undefined Command

## Illegal Command (ICMD)

### ■ Response Format




| Item | Description |
|---|---|
| Response code | 0000: Normal end<br>For other Response codes, refer to *Response Code List*.<br>*p. 71* |

# SECTION 6
# Browser-Based Interface


| | |
|---|---|
| Using the Browser-Based Interface | 130 |
| Option Mode | 131 |
| Safe Mode | 145 |

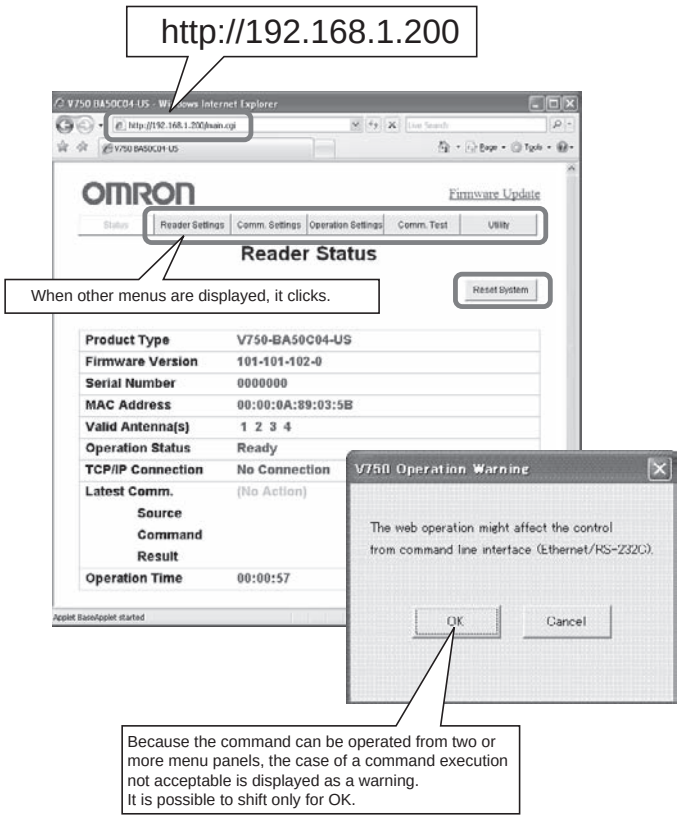
# Using the Browser-Based Interface

You can display and operate the reader's Web interface by accessing the reader's IP address (the default is 192.168.1.200) via Web browser enabled Java(TM) Runtime.
Only one user can access to this web interface at a time. When a user-A is operating via web interface and if another user-B accesses to the same reader, only the user-B can operate it.

## ■ Composition of status screen and other menu buttons

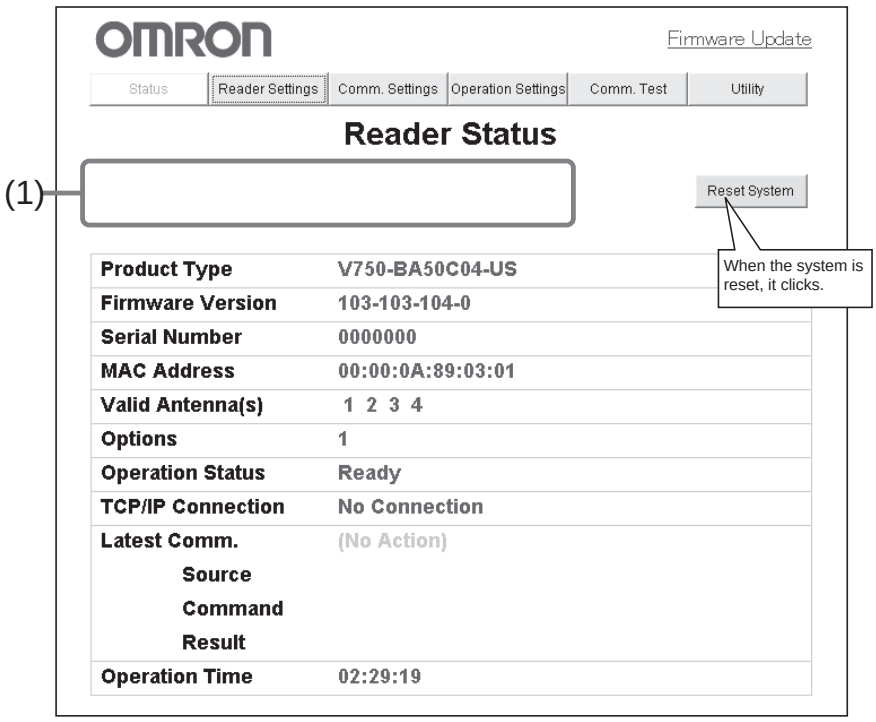
The menu buttons are located above on the opening status windows. You can choose other operation menu by clicking this menu buttons. The menu buttons are shown as below.

| Status | Reader Settings | Comm. Settings | Operation Settings | Comm. Test | Utility |
|---|---|---|---|---|---|



# Option Mode

## Status




Note1: (1) is a display area in the state.

| Item | Description | Note |
|---|---|---|
| Product Type | Type name of the product<br>V750-BA50C04-US | Fixed data |
| Firmware Version | Firmware version currently installed in the reader.<br>XXX-XXX-XXX-X | Stable data if not updated firmware |
| Serial Number | Unique number for product set in the factory. | Fixed data |
| MAC Address | The reader's MAC address. | Fixed data |
| Valid Antenna(s) | Antenna(s) the reader has detected at start-up.<br>- In blue: valid<br>- In light gray: invalid | Stable data that does not change after start-up |
| Options | Indicates effective options | Support is provided for the firmware version 103-103-104-0 or later. |
| Operation Status | Indicates the reader's status with the following code.<br>- Ready: waiting for command<br>- Communicating : command being executed<br>- Setting Error - XXX(YY):Setting Error occurred<br>- System Error (ZZ) : system error occurred | See below the Error code list for detail. (*1) |
| TCP/IP Connection | Indicates TCP/IP port connection status:No Connection / Connected | |

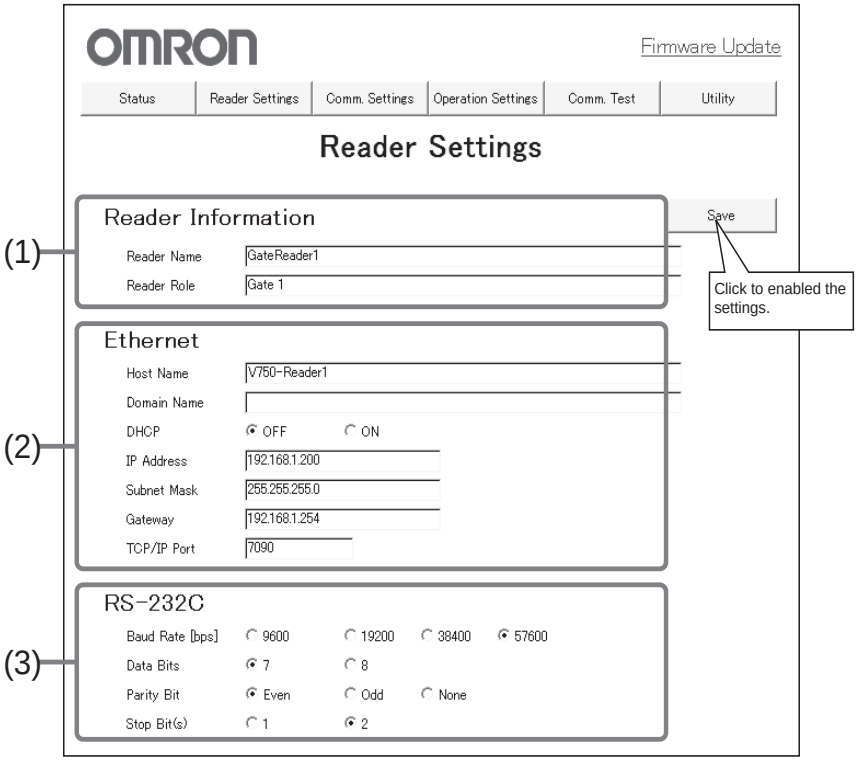
| Item | | Description | Note |
|---|---|---|---|
| Latest Communication (Latest Comm.) | | Indicates "Active" in orange if a command is being executed. | |
| | Source | Interface name of command execution source.<br>Ethernet / RS-232C / IN1 / IN2 / IN3 / IN4 / Web | It indicates the current command status by using command I/F (Ethernet/RS-232C) or the other registered command. |
| | Command | The command code that is being executed.<br>Ex.) RDID -ANT 1 -TMO 1000 | It indicates the executed command. |
| | Result | Executed result (Command, response code, and the number of tags)<br>Ex.) RDID0000 001 | After communication completed, the response are shown. It remains blank if the command is being executed or has not been executed yet. |
| Operation time | | Time past after start up.<br>Ex.) 01:23:45. | Time starts with "00:00:00"at the start-up.<br>If the time exceeds 9999:59:59, the indication returns "00:00:00". |

Note2:Error code detail for the reader status ( Note1)

In case of Setting Error, the error cause is shown by both character and its code

| Status code (YY) | Description (XXX) | Error type |
|---|---|---|
| 31 | DHCP Server | DHCP Server error |
| 33 | Comm. Settings | Communication setting error |
| 35 | Comm. Settings | Communication setting error |
| 36 | Operation Settings | Operation setting error |
| 37 | Reader Settings | Reader setting error |

# Reader Settings




(1) Reader Information

| Item | Description | The range of the set code | Default |
|---|---|---|---|
| Reader Name | Reader name defined by its user. | Represented with from 1 to 63 ASCII characters. | (None) |
| Reader Role | The role of the reader defined by its user. | Represented with from 1 to 63 ASCII characters. | (None) |

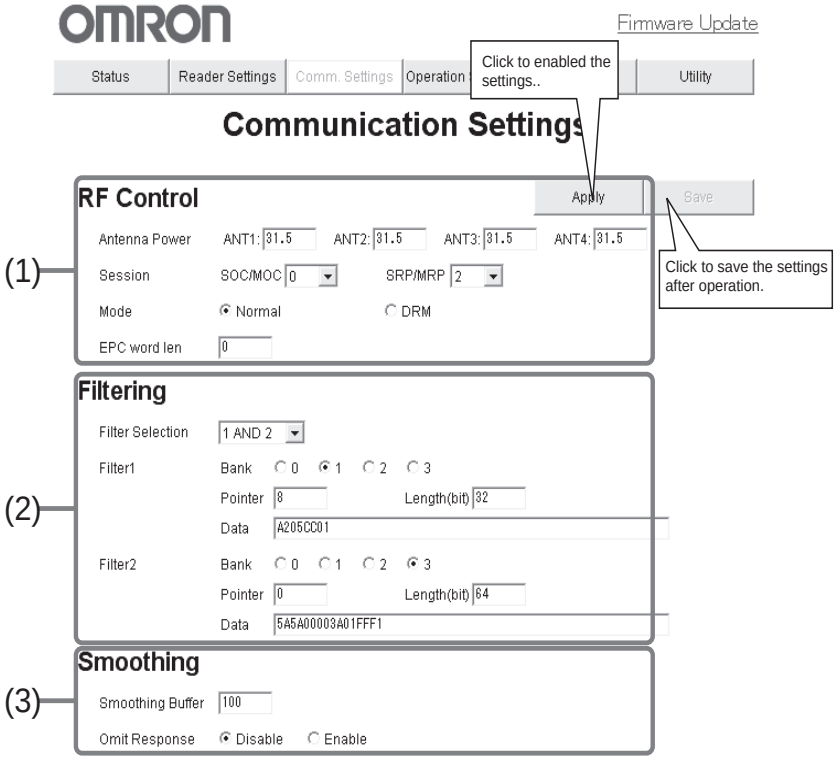
(2) Ethernet

| Item | Description | The range of the set code | Default |
|---|---|---|---|
| Host Name | Name to refer the host in the network | Represented with from 1 to 63 ASCII characters. | V750-BA50C04-US |
| Domain Name | Domain name in the network environment for the reader. | Represented with from 1 to 67 ASCII characters. | (None) |
| DHCP | Whether the reader uses DHCP serve or not. | Disabled / Enabled | Disabled |
| IP Address | IP address of the reader | | 192.168.1.200 |
| Subnet Mask | The reader's subnet mask address. | | 255.255.255.0 |
| Gateway | The reader's Gateway address. | | 192.168.1.254 |
| TCP/IP Port | Port number of command interface. | 1025 to 65534 | 7090 |

(3) RS-232C

| Item | Description | The range of the set code | Default |
|---|---|---|---|
| Baud Rate (bps) | Communication speed | 9600 / 19200 / 38400 /57600 | 57600 |
| Data Bits | Communication data length | 7 / 8 | 7 |
| Parity Bit | Parity bit | Even / Odd / None | Even |
| Stop Bit(s) | Stop bit | 1 / 2 | 2 |

# Communication condition Settings




(1) RF Control

| Item | Description | The range of the set code | Default |
|---|---|---|---|
| Antenna Power | Power (dBm) of each antenna (from 1 to 4) | 10.0 to 32.0<br>(Truncate by 0.5.<br>Ex. 10.3 is truncated to 10.0 and 10.8 is truncated to 10.5.) | Every antenna: 31.5 |
| Session | Session number of Gen2 protocol.<br>(set for Multi sequence and Single sequence respectively) | 0 / 1 / 2 / 3 | SOC/MOC - 0<br>SRP/MRP - 2 |
| Mode | Communication mode | Normal / DRM | Normal |
| EPC word len | EPC word length | 0 to 32 (Step : 1) | 0 |

* The range of antenna output power is different on each the reader which has different certification number. The certfication number is shown on product label attached the reader.

(2) Filtering

| Item | | Description | The range of the set code | Default |
|---|---|---|---|---|
| Condition Selection | | Determines filtering condition | None / 1 / 2 / 1 and 2 / 1 or 2 | (None) |
| Condition 1 | | Set value of the Condition 1 | | |
| | Bank | Communication data bit length | 0 to 3 (including threshold values) | (None) |
| | Pointer | Comparison start point | 0 to 255 (including threshold values). | (None) |
| | Length | Comparison bit length | 1 to 255 (including threshold values) | (None) |
| | Data | Comparison data | Data length/ more than 1 or more and 64 or less | (None) |
| Condition 2 | | Set value of the Condition 2 | | |
| | Bank | Communication data bit length | 0 to 3 (including threshold values) | (None) |
| | Pointer | Comparison start point | 0 to 255 (including threshold values). | (None) |
| | Length | Comparison bit length | 1 to 255 (including threshold values) | (None) |
| | Data | Comparison data | Hex string whose length is 1 or more and 64 or less | (None) |

*1)
Only selectable items are selectable as input condition.

*2)
The comparsion condition can specified by bit unit in the data length, while the comparison data need to be specified by byte unit. Set the byte above bit unit as the comparison data. For example, if you want to set the comarsion condition as "1" in 3 bits, set the "70" as the comparsion data.

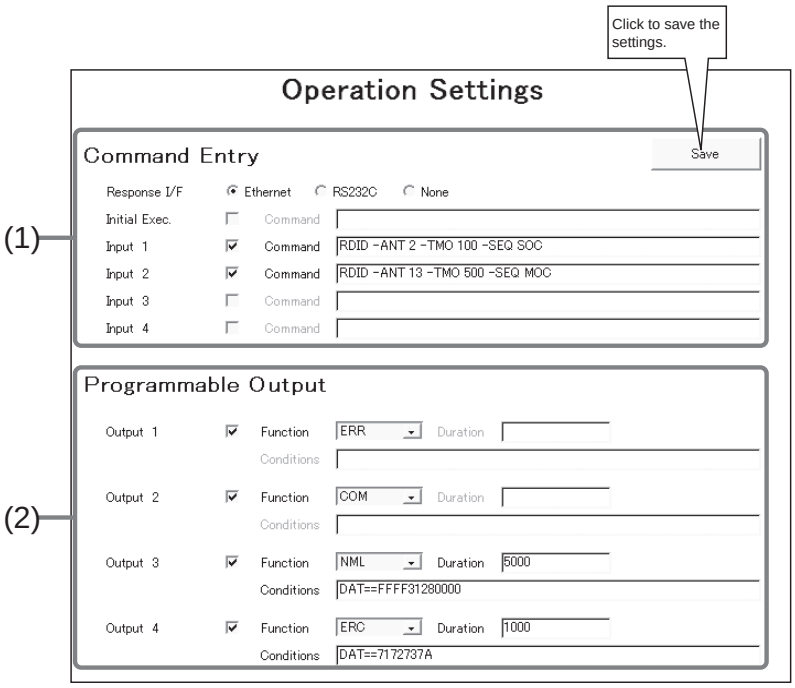
(3) Smoothing

| Item | Description | The range of the set code | Default |
|---|---|---|---|
| Smoothing Buffer | Prevents rereading | 0 to 999 (including threshold values) | 0 |
| Omit Response | Omits response for no tag | Disable / Enable | Disable |

*3)
This function enables the reader to respond one time for each reading RF tag data even if the reader communicate several times continously for the purpose to reduce the network trafic or to simplify the programming.
The reader buffered the RF tag data which once read, and no longer respond the data to the host system during its data in the buffer. The setting value is the number of RF tags to be buffered. The buffered data will clear at the timing when the reader receive the command completion( such as the timing to receive STOP command).

*4)
This function enable not to respond the no tag response if the RF tags do not exist in the field.
All parameter modified are vailid after clicking "Apply" button, and these are effective from next command execution.
The settings are applying on each items step by step, with following order.
RF control, Filtering, Smoothing.
If the settings scuess, the item turns in blue, and if it has error, it turns in red.
If the error happened on particlar items, it and following items are not changed.
If you click the "Store" button following "Apply" button, the settings are stored in the internal memory, and its effective for next boot-up.

# Operation Settings




(1) Command Entry

| Item | Description | The range of the set code | Default |
|---|---|---|---|
| Response Interface | Interface selection to send response of the command | Ethernet / RS-232C / None | Ethernet |
| Initial Exec (*1) | Initial command executed automatically on booting | Command characters | (None) |
| Input 1 (*1) | Command executed when input port 1 is activated | Command characters | (None) |
| Input 2 (*1) | Command executed when input port 2 is activated | Command characters | (None) |
| Input 3 (*1) | Command executed when input port 3 is activated | Command characters | (None) |
| Input 4 (*1) | Command executed when input port 4 is activated | Command characters | (None) |

*1)
The command can be inputted and registered to check the box in each timing ( Power-up, IN1 to IN4 ).

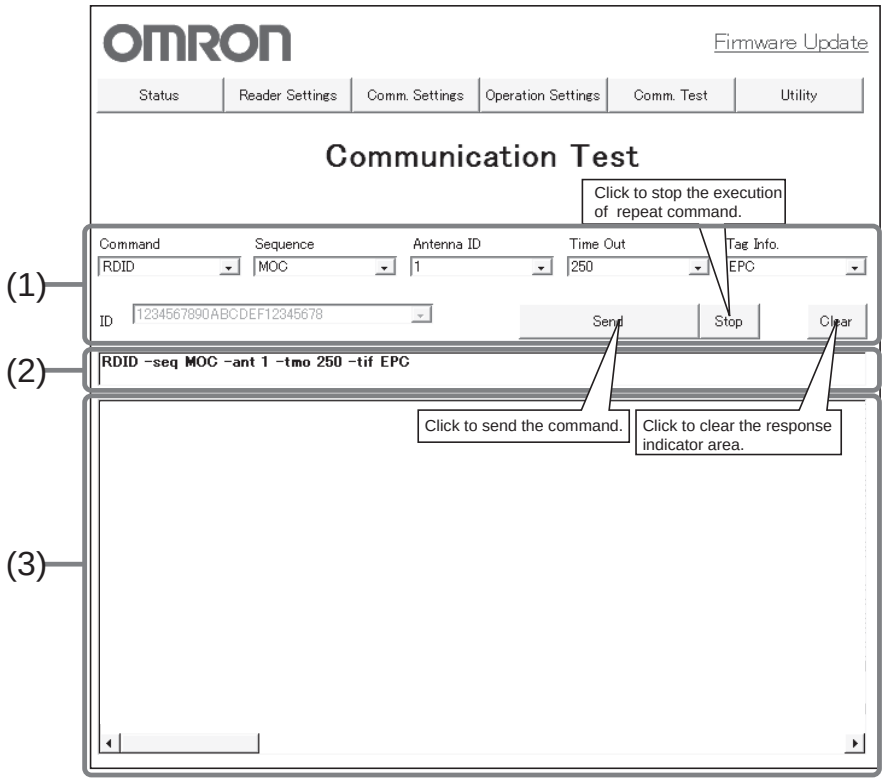
(2) Programmable Output

| Item | | Description | The range of the set code | Default |
|---|---|---|---|---|
| Output 1 (*1) | | Programmable output 1 settings | | |
| | Function | Output function synchronize with this port | RUN / ERR / COM / ANT1 / ANT2 / ANT3 / ANT 4 / NML / ERC | (None) |
| | Duration [ms] (*2) | Duration for output | 0 or more and less than 9990 | (None) |
| | Condition (*2) | Condition for output (Available only when function is NML or ERC) | | (None) |
| Output 2 | | Programmable output 2 settings(Setting items are the same as Output 1) | | |
| Output 3 | | Programmable output 3 settings(Setting items are the same as Output 1) | | |
| Output 4 | | Programmable output 4 settings(Setting items are the same as Output 1) | | |

*2)
The programmble output(OUT1 to OUT4) can be enabled to input by checking the box.

*3)
It requires the setting when the NRL or ERC is selected as trigger. The settings are effective to store the inputted condition in the internal memory by clicking "Store" button and after re-booting. Storing process take effect in the order from top of the list and turns on blue if the item correctly stored. If the error occurs, it turns on red and the process is terminated.

# Communication Test




(1) Option List

| Item | Description | Note | Default |
|---|---|---|---|
| Command | RDID / WTID | | RFID |
| Sequence | SOC / MOC<br>SRP / MRP (Firmware version 101-101-102-0 or later) | When only "RDID" command is selected, it can be selectable. | SOC |
| Antenna ID | 1 / 2 / 3 / 4 | | 1 |
| Time Out | 250 / 500 / 1000 / 2000 | | 250 |
| Tag Info. | EPC / EPC,ANT / EPC,CNT / EPC,ANT,CNT | | EPC |
| ID | 1234567890ABCDEF12345678 / 11112222333344445555666 6 / AAAABBBBCCCCDDDDEEEEFFFF / 87654321FEDCBA0987654321 | When only "WTID" command is selected, it can be selectable. | 1234..... |

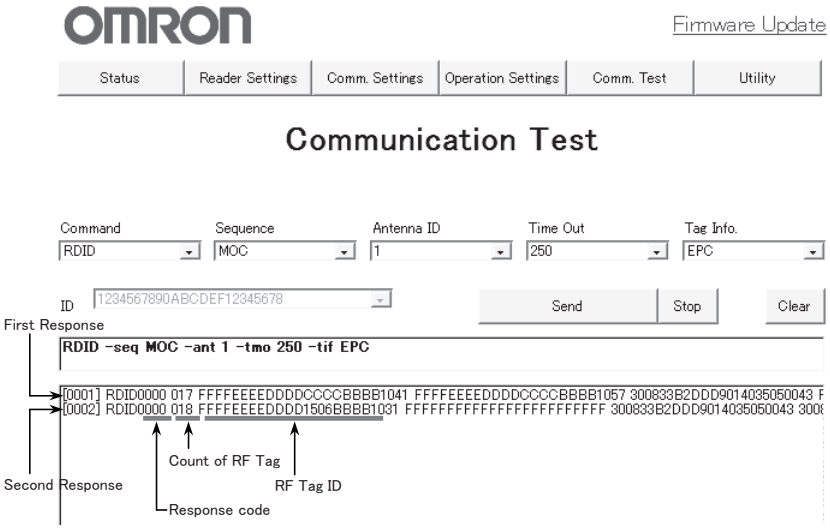
(2) Communication command input area

CThe command selected by (1) is displayed in this area.

The command can be edited directly in this area.

(3) Response display area

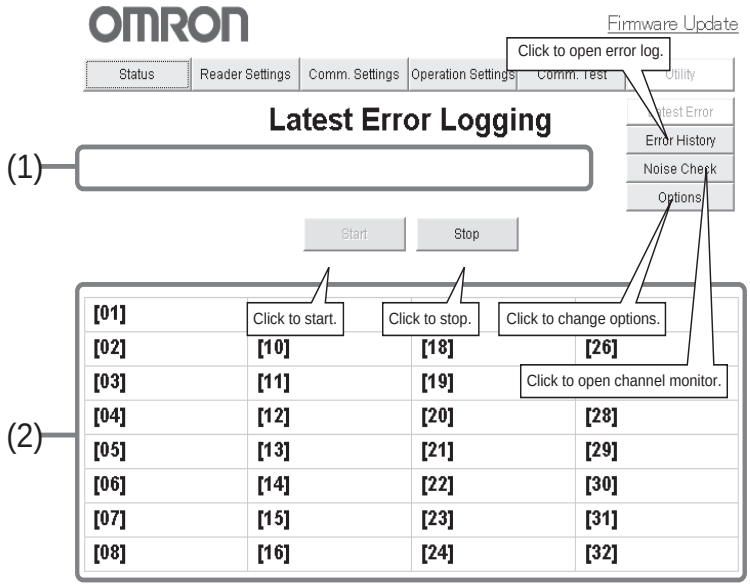
The response after the command is transmitted is displayed in this area.



# Utility

The V750 reader serves 3 functions that assist you to operate it usefully.

## ■ Latest Error Logging



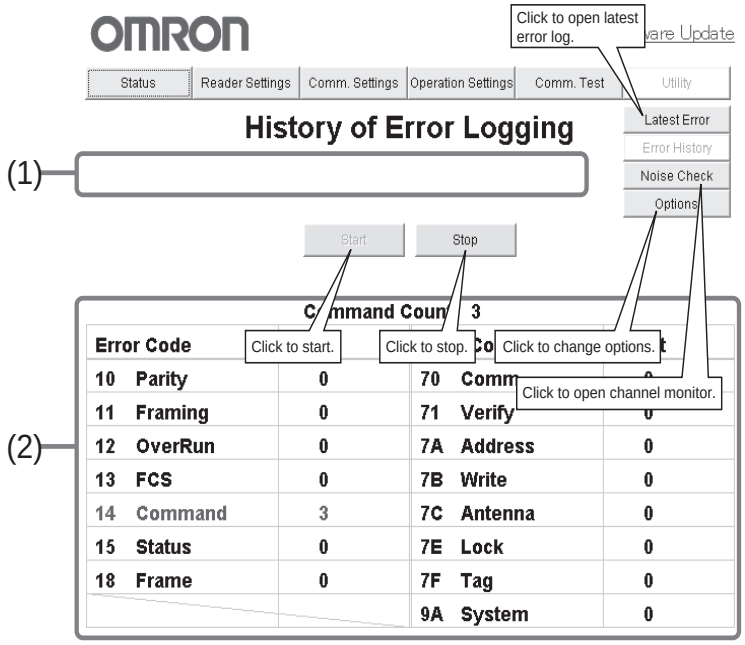

(1) Status Indicator Area

(2) Latest Error log

Error log(Command Code and Termination Code) are shown which errors occur after booting up the reader.

Up to 32 latest error logs are shown. Click the "Start" button to refresh the error log. To stop refreshing, click "Stop" button. The error are updating in real time until it stop the logging. The error log can be cleared by resetting or rebooting the reader.

## ■ History of Error Logging




(1) Status Indicator Area

(2) Number of error time

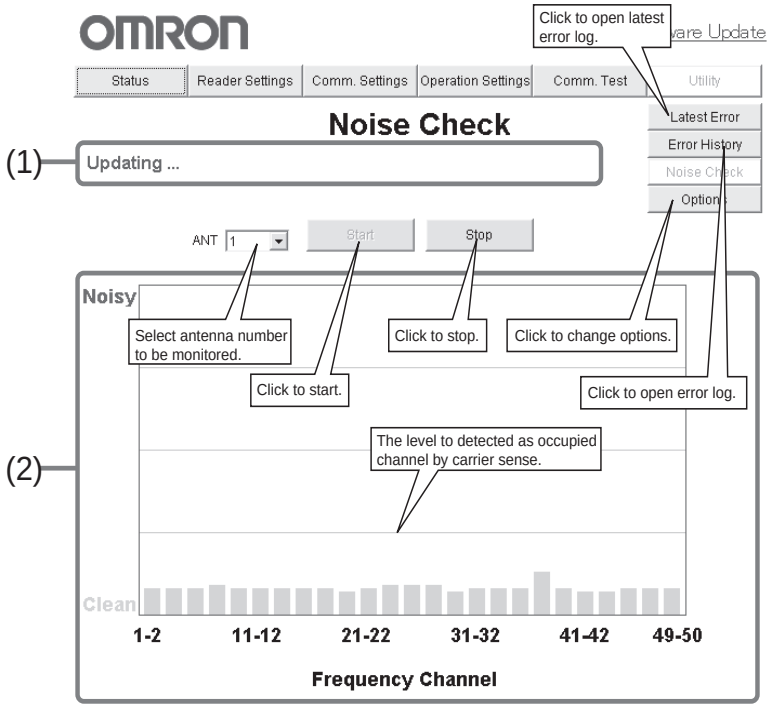
The total number of error after booting the reader are shown. The number of the command execution are shonw in above column.

The number of errors are shown in each kinds of errors (Upper two digits of Termination code).

Click the "Start" button to refresh the error log. To stop refreshing, click "Stop" button. The error are updating in real time until it stop the logging. The error log can be cleared by resetting or rebooting the reader.

Up to 65535 error number can be counted.

## ■ Noise Check

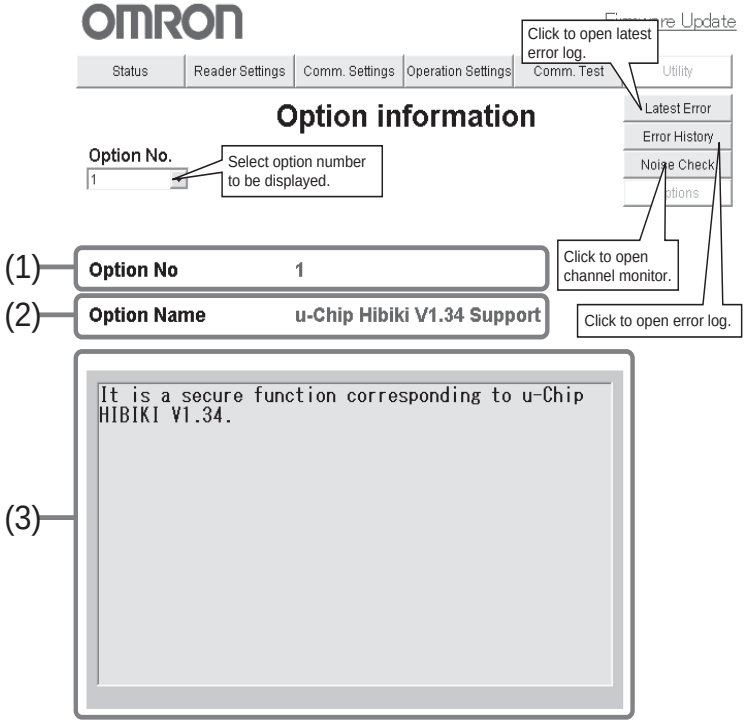



(1) Status Indicator Area

(2) Channel monitor

The field strength of each channels are shonw in bar graph. To start the monitroing the chanel, choose the antenna number and click the "Start" button. The field strength is updating in real time. Click the "Stop" button to stop monitoring. The line in the graph indicates the level for Carrier Sense which uses to check the availablity of channel (If the field strength is below this level, the channel is available.) Use this level as refernce only.

## ■ Option information




*Support is provided for the firmware version 103-103-104-0 or later.

(1) Option No

**To display the information of available options,** select [Option No.]

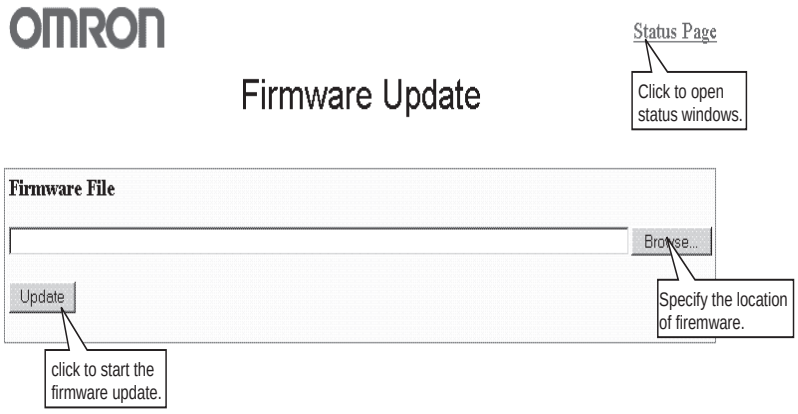
(2) Option Name

**To display the information of available options,** select [Option Name.]

(3) Option information

To displya the information of options. The contents shown in this option depends on the option.

# Firmware Update



To update the firmware, select the reader firmware file on the reference button and click the "update". When the update starts, the antenna indicator on top of the reader turns on, and IN/OUT indicator turns step by step to represents the progress of update.
In the monitor screen, the progress bar is shown. When the firmware upgrade is complete, all the indicator(Antenna, IN/OUT) turn on, and message comes up on the monitor screen. If the firmware upgrade are completed successfully, the reader will re-boot after 3 sec.

CHECK! Do not power-off during firmware upgrade.

# Safe Mode

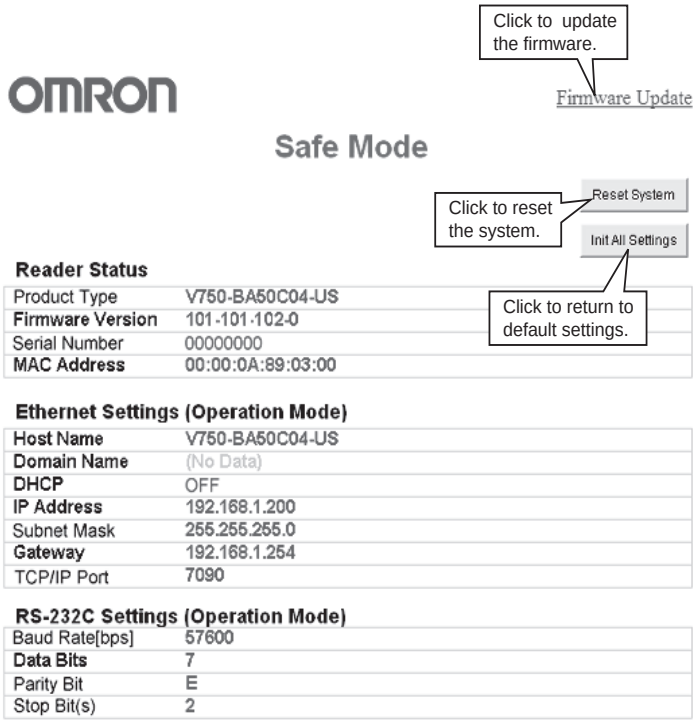
Safe Mode is used for confirming the essential reader settings.
You can obtain the setting information even though the reader has trouble in operation mode; for example, you can not access with Ethernet because of system error or your losing Ethernet IP address information.
On safe mode, only status page and firmware update page are available.

## Status Page

### • Function

Shows the information of reader status, Ethernet and RS-232C settings. Item value is displayed as operation mode (Except Firmware Version).

### • Screen Image



## ■ Description of Each Item

### • Reader Status

| Item | Description | Note |
|---|---|---|
| Product Type | Type name of the productV750-BA50C04-US | |
| Firmware Version | Firmware version currently installed in the reader.100-100-100-0 | Only the factory-default first number is displayed |
| Serial Number | Unique number for product set in the factory. | |
| MAC Address | The reader's MAC address. | |

### • Ethernet Settings (Operation Mode)

| Item | Description |
|---|---|
| Host Name | Used to refer the host in the network |
| Domain Name | Name of network domain in the reader runs. |
| DHCP | Whether the reader uses DHCP server or not. |
| IP Address | The reader's IP address in the network |
| Subnet Mask | The reader's subnet mask in the network |
| Gateway | The reader's gateway address in the network |
| TCP/IP Port | Port number for command interface via Ethernet |

### • RS-232C Settings (Operation Mode)

| Item | Description |
|---|---|
| Baud Rate [bps] | Baud rate [bps] |
| Data Bits | Data bit length |
| Parity Bit | Parity bit |
| Stop Bit(s) | Count of stop bit |

### • Action

**[Reset System]**

**To restart the system,** press [Reset System] button. After displaying message "Accept RESET. Reboot in one second." After resetting the reader, you can access the browser by clicking Reload button or opening another browser page.

**[Init All Settings]**

**To initialize all the settings of the reader,** press [Init All Settings] button. After displaying message " Accepted INIT. Reboot in one second.", all the reader's settings are initialized to factory installed settings. After initializing the reader, you can access the browser by clicking Reload button or opening another browser.

### • Errors

1)Can Not Connect

It means that the host computer can not receive the data from the reader. In this case, you have to check the Ethernet connection, restart the browser and then access the reader again.

# SECTION 7
# Troubleshooting Alarms and Errors


| | |
|---|---|
| Errors and Countermeasures | 148 |
| Maintenance and Inspection | 151 |
| Troubleshooting | 152 |

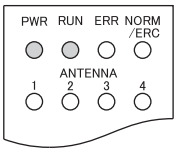
# Errors and Countermeasures

The reader shows various indication or message when the error occurs to inform the reader error status correctly. The errors are distinguished as follows.

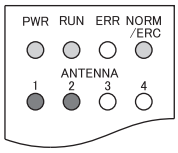
## ■ Error on reader

The operation status indicator on top of the reader shows the error of the reader itsself if it's happened. The following figure shows lit condition for normal operation, and if error occurs, the indicator shows differently

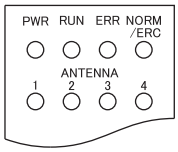
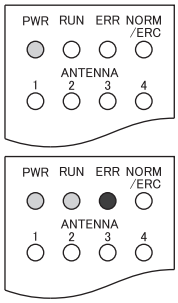
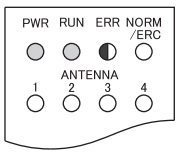
the ready state which wait to receiving the command from host system.

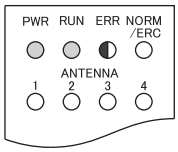



On the communication state when getting the command and execute the communication with RF tag.




The antenna indicator lits on which the reader receive the command.

| Operation Status Indicator | Potential cause | Countermeasure |
|---|---|---|
| The power indicator does not lit.  | AC adapter does not connect correctly. | Check the connection at the DC line.<br>Check the connection at the AC100V line. |
| | Failure of AC adapter | Check the DC12V output at the DC plug of AC adpater by using Voltage tester.<br>*Note : Do not execute this confirmation process if you are not electrical specialist to allow this operation. Please ask your sales representative of Omron. |
| | Failure of the reader | Please ask your sales represenative of Omron. |
| RUN indicator does not lits, or ERR indicator lits.  | Failure of the reader | Execute power-on reset. If the reader still indicates same after power-on reset, please ask your sales representativ of Omron. |
| ERR indicator blinking (fast blinking)  | The setting error on the reader | The settings on the reader does not set up correctly. Check and correct your settings.<br>The power-off during executing the setting command, or communcation settings error, DHCP server connection error. |

| Operation Status Indicator | Potential cause | Countermeasure |
|---|---|---|
| ERR indicator blinking (slow blinking)<br>  | The state of ready to operate | The state of establishing connection<br>Or, during execution on the command registration process via Ethernet I/F. |

## ■ The operation error of the reader.

The operation error of the reader consists of  the setting error and the command input error.

• It can distigunish the error by checking the error code at the termination code on the response.

Follow the instruction of "*Check item of each Response code* " of the "*Troubleshooting* " in this chapter.

p. 152

• Web browser I/F shows error messages on its status windows. Refer to this window and execute the adequate countermeasure.

## ■ The communication error with RF tags

The communiction error comes from various situation such as insufficent anntenna installation, or the environmental influences of mutul interferences between several reader and effects of reflections, or setting error on the reader. Also RF tag may cause the communication error such as the influences of materials and condition of which RF tag attached and orientation of RF tag.

The cause of insuffienct communication with RF tags comes from various causes. Refer the following items, and check the environmental condition.

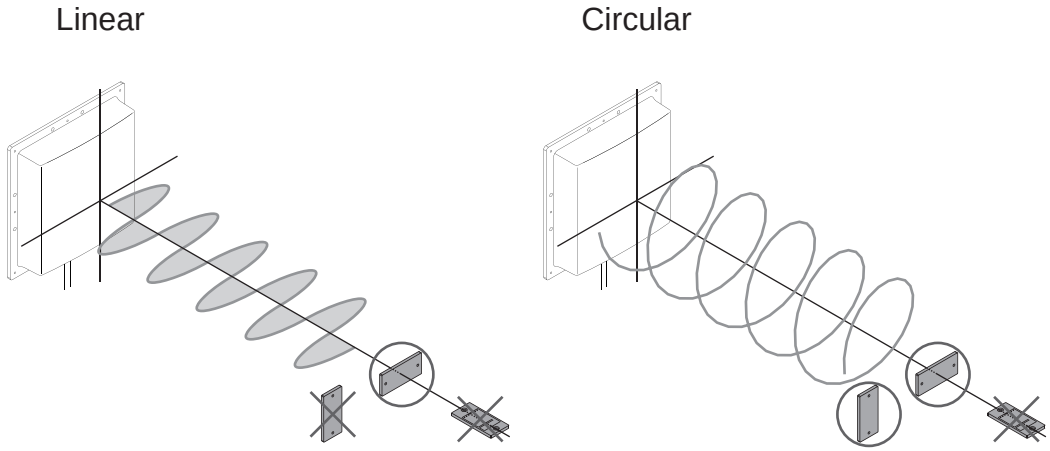
1. Mutul interferences on the readers.
   If multiple readers are installed, the mutual interferences occurs between those readers. To avoid the interferences, firstly it is effective not to transmitt and communicate at the same time. If it needs to trasmitt and communicate at the same time, adjust the output power level not to output unwanted level or carefully select the channel to be transmitted not to allocated closely tgo minimize the inteferences.

2. Antenna installation
   The communication range for Circular poralization antenna(Model V740-HS01CA) and Linear poralization antenna(Model V740-HS01LA) are slightly different. Check the communication range, and install the antenna and RF tag position within this range to have enugh margin.

3. The reader settings
   The settings of the reader which may influences communication performance are below. Please carefully specify the command option.
   • Communication Sequence ( single once, single repeat, multi once, multi repeat)
   • timeout value ( communication duration 100 to 5000[msec] range)
   • antenna number( the antenna order for transmiting)
   • Sesson flag ( Duration for keeping power-on reset for RF tag)

4. Condition of the RF tag installation ( materials, orientation)
   The communication range may reduce even if the materials which attached RF tag is not metal.
   The communication range may vary by the orientation of the RF tag.

   Above figure shows the communication performance with stanard RF tag orientation.
   In the X marked orientation, it can not be communicate or extremaly reduced the communication range.




上記は一般的なRFタグでの向きによる交信可否を示した図です。
×印のRFタグの向きは、交信できないまたは交信距離が極端に短くなります。

## ■ Ethernet Communication Erro:

When the connection with Ethernet has issues, please check following.

- LAN cable connected correctly?
- Not use straight LAN cable when the reader and host PC connect directly? ( When connect the reader directly to the host PC use crossover LAN cable.)

When you forgot the IP address of the reader,  execute the following instruction.

- Boot-up the reader with Safe-mode. ( IP address for the Safe-mode is alwasy fixed at [192.168.1.200])
  Set the IP address on the web brozwer I/F.

# Maintenance and Inspection

The V750 Series Reader/Writer and Antenna must be inspected on a daily or regular basis so that the functions of the V750 Series can be used in good condition.

The V750 Series consists of semiconductors that last almost indefinitely. The following malfunctions may, however, result due to the operating environment and conditions.

1. Element deterioration due to overvoltage or overcurrent.
2. Element deterioration due to continuous stress caused by high ambient temperature.
3. Connector contact faults or insulation deterioration due to humidity and dust.
4. Connector contact faults or element corrosion due to corrosive gas.

## ■ Inspection Items

| No. | Item | Detail | Criteria | Required equipment |
|---|---|---|---|---|
| 1 | Supply voltage fluctuation | Check that the supply voltage fluctuation at the power supply terminal block is within the permissible range. | Within supply voltage specified range | Multimeter |
| | | Check that there are no frequent instantaneous power failures or radical voltage fluctuations. | Within permissible voltage flucuation range | Power supply analyzer |
| 2 | Ambient environment<br>1) Temperature<br>2) Humidity<br>3) Vibration and shock<br>4) Dust<br><br>5) Corrosive gas | <br>1) Within the specified range<br>2) Within the specified range<br>3) Influence of vibration or impact of machines<br>4) Check that the system is free of accumulated dust and foreign particles.<br>5) Check that no metal part of the system is discolored or corroded. | <br>1) Within the specified range<br>2) Within the specified range<br>3) Within the specified range<br>4) Neither is permitted.<br><br>5) Neither is permitted. | Maximum and minimum thermometer<br>Hygrometer |
| 3 | I/O power supply<br>1) Voltage fluctuation<br>2) Ripple | Check on the I/O terminal block that the voltage fluctuation and ripple are within the permissible ranges. | Within the specified range | Multimeter<br>Oscilloscope |
| 4 | Mounting condition | Check that each device is securely mounted. | No loose screws | --- |
| | | Check that each connector is fully inserted. | Each connector must be locked or securely tightened with screws. | --- |
| | | Check that no screw of the terminal block is loose. | No loose screws | --- |
| | | Check that no wire is broken or nearly broken. | Must be no wire that is broken or nearly broken. | --- |
| | | Check that the distance between the Tag and Antenna is within the specified range. | Within the specified range | --- |

# Troubleshooting

## Check item of each Response code

| Response code | Check item |
|---|---|
| No correspondence | • Is there the communication condition setting between Host device and Reader/Writer?<br><For Ethernet><br>Does Ethernet Cable use the correct one?<br>Is the setting of Ethernet correctly set?<br><For RS-232C><br>Is the setting of RS-232C correctly set?<br>Baud Rate, Data Length, Stop Bit Length, Parity, Control code (SOH/FCS/CR)<br>It confirms whether for Stop command (STOP) to become no response.<br>• Is not the command transmitted on the way power supply ON or after the reset command is transmitted of processing (about 2.5 seconds) in the early? |
| 10 | • Is there the communication condition setting between Host device and Reader/Writer?<br>Baud Rate, Data Length, Stop Bit Length, Parity (Even/Odd/None)<br>• Is not the noise generated near the communications cable? (For RS-232C)? |
| 11 | |
| 12 | |
| 13 | • Is FCS correct? (Calculation, format(Binary, 2byte)) (For RS-232C) |
| 14 | • Is the command format correct?<br>Communications Designations, Data specification, Type of tag, Page, Write data |
| 15 | • Is not another executed Command (Excluding STOP and REST, etc.) transmitted while executing the command?<br>• Is not the command of the condition that cannot be executed transmitted? |
| 18 | • Does not Data Length of the command more than 512 bytes? |
| 7000 | • Do not two or more Reader/Writere communicate?<br>• Has not the channel setting used been reduced? |
| 701X | • Isn't the password wrong in the command that should specify the password?<br>• Does tag exist in steady communication area?<br>• Is not the page of tag outside the memory range specified?<br>• Is it tag supported by Reader/Writer? |
| 702X | • Is the distance between tag and the antenna a distance in which it can communicate?<br>• Does not tag move while processing the communication?<br>• Does not two or more tag exist in communication area? |
| 71 | • Does not the writing frequency of tag exceed memory lonevity?<br>• Is not the written page locked?<br>• Is it tag supported by Reader/Writer? |
| 7A | • Is the memory specification of tag (memory bank, address, etc.) correct? |
| 7B | • Is the distance between tag and the antenna a distance in which it can communicate?<br>• Does not two or more tag exist in communication area? |
| 7C | • Is the antenna correctly connected with Reader/Writer?<br>After connecting the antenna and the antena cable, did you turn on power? |
| 7E | • Do not you write it in Lock Area? |
| 7F | • Is an enough electric power supplied to tag?<br>• Is it tag supported by Reader/Writer? |
| 9A | • There is a possibility that Reader/Writer is out of order when generated continuously. |
| ICMD | • The mistake is found in the command code of the command. |

# SECTION 8
# Reference data


| | |
|---|---|
| Communications Time | 154 |
| Receiving Level Detection | 157 |

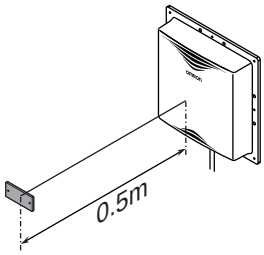
# Communications Time

The following charts show communication time on each mode. It is influenced on practical matters, for example, radio noise, distance between tags, materials tags are on and other environmental matters. Communication time is measured in shielded room with one reader, so that no reflection and no interference are considered.
You can refer these charts on determining time out value of the reader command. But you must keep in mind actual communication time on your environment may not correspond to these charts because of the reasons already described.

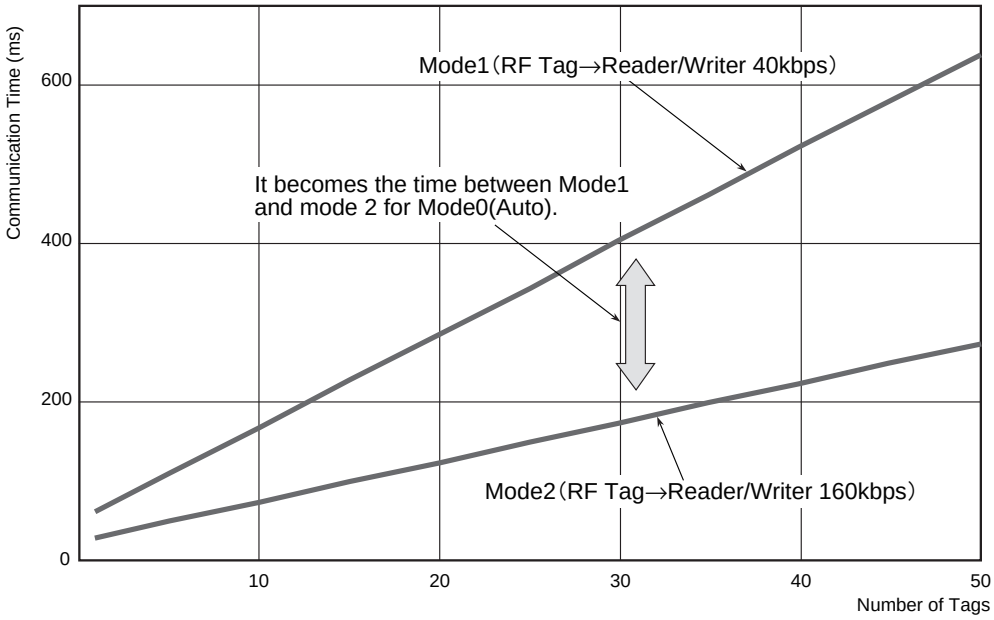
## Multi ID Read

### ■ Measurement condition at Communication Time

| | |
|---|---|
| environment: | Anechoic Chamber |
| Distance: | 0.5 m fixation (Distance between antenna and tag) |
| Condition: | Communication time required to read 20 tag EPC(96bit) is measured. It calculates by the calculating formula after that. |




### ■ Communications Time Detection (Multi ID Read)




The baud rate for Mode0(Auto mode) is decided by the interference situation between two or more Reader/Writer.
The baud rate in the state without interference completely becomes 160kbps(RF Tag→Reader/Writer).

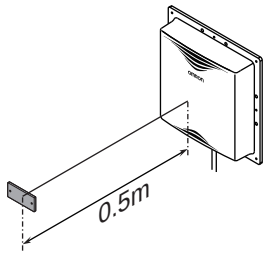
# Single ID Read/Write

## ■ Measurement condition at Communication Time

environment: Anechoic Chamber

Distance: 0.5 m fixation (Distance between antenna and tag)

Condition: Communication time required to read 20 tag
EPC(96bit) is measured.




## ■ Table of Communication Time

| Mode | Single ID Read | Single ID Write |
|---|---|---|
| Mode1 (40kbps) | 13msec | 108msec |
| Mode2 (160kbps) | 9msec | 86msec |

# Multi Data Read

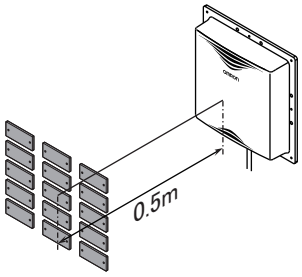
Following charts shows the standard at the communication time of multi data read added with firmware version 105-106-105-0 or later.

## ■ Measurement condition at Communication Time

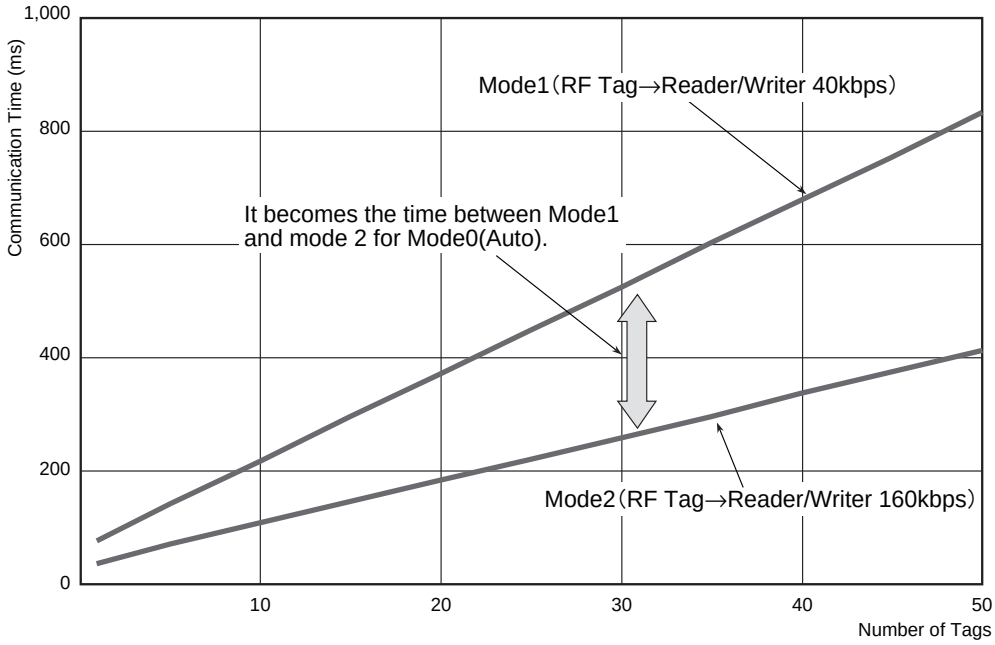
environment: Anechoic Chamber

Distance: 0.5 m fixation (Distance between antenna and tag)

Condition: Communication time required to data read (6 Word) 10 tag EPC(96bit) area is measured.
It calculates by the calculating formula after that.




## ■ Communications Time Detection (6Word Multi Data Read)




The baud rate for Mode0(Auto mode) is decided by the interference situation between two or more Reader/Writer.

The baud rate in the state without interference completely becomes 160kbps(RF Tag→Reader/Writer).

## ■ Calculating formula at Communication Time (Multi Data Read)

| Mode | MIN | MAX |
|---|---|---|
| Mode 0 | $T = (7.0 + 0.1 \times w) \times n + 32$ | $T = (13.9 + 0.3 \times w) \times n + 65$ |
| Mode 1 | $T = (13.9 + 0.3 \times w) \times n + 65$ | |
| Mode 2 | $T = (7.1 + 0.1 \times w) \times n + 32$ | |

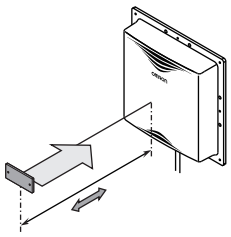
T :Time (ms)
w :Count of words
n :Count of read tag(s)

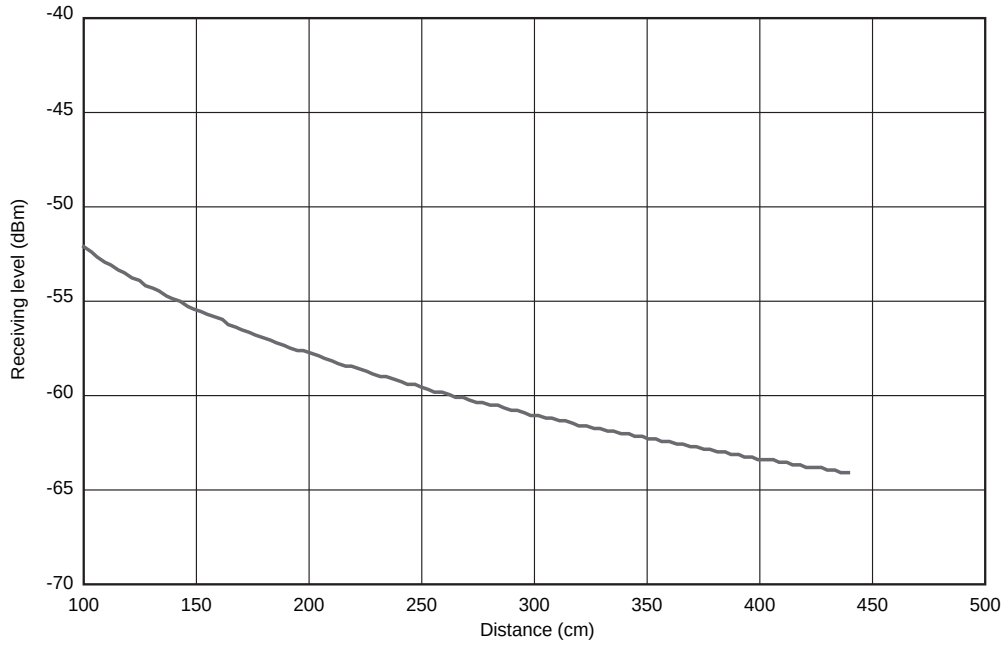
# Receiving Level Detection

You can obtain receiving levels of the signals sent from tags (described at dB, Step: 0.125dB) by specifying "LVL" option as "-tif" parameter while the ID read command is executed.
In UHF band RFID system, communication distance between a reader and tags depends on the direction of the tag surface, types of tags, or material of objects to which tags are attached. This function enables the reader to measure rate of the impact due to the directions of tag surfaces, circumstances, or the material of the object.
As a reference, following figure shows measurement results of receiving levels when the distance between the antenna of the reader and tag is simply changed.

## ■ Measurement condition at Receiving Level

| | |
|---|---|
| environment: | Anechoic Chamber |
| Distance: | 100cm to 480cm (Distance from antenna to tag) |
| Condition: | Antenna: Circular antenna (V740-HS01CA)<br>Reader's output: 28.5dBm |






When the distance between the reader antenna and tags becomes double, the receiving level of signals is attenuated by about 6dB.

This function is available in firmware version 102-102-103-0 or later

MEMO

# SECTION 9
# Appendices


| | |
|---|---|
| Accessory | 160 |
| Degree of Protection | 161 |

# Accessory

## ■ Reader's accessory

| No. | name | model | Number |
|---|---|---|---|
| (1) | AC Adapter | --- | 1 |
| (2) | External Input/Output terminal plug | MC1.5/10-STF-3.81 (procuced by PHOENIX CONTACT) | 1 |
| (3) | Instruction sheet | --- | 1 |
| (4) | Instruction sheet for accessories | --- | 1 |

<Explanation>

(1) AC Adapter

Always use this AC adpater when you power the reader.

(2) External Input/Output terminal plug

Always use this terminal plug when you wired the external signal input/output from the external devices.

(3) Instruction sheet

Read this instruction sheet carefully before you use the reader.

(4) Instruction sheet for accessories

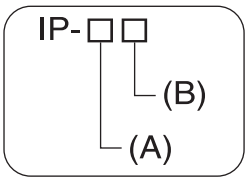
Check all accessories included decribed on this instruction sheet when you open the box firstly.

# Degree of Protection

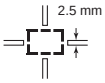
Ingress protection degrees (IP-□□) are determined by the following tests. Be sure to check the sealing capability under the actual operating environment and conditions before actual use.

IP indicates the ingress protection symbol.

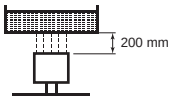
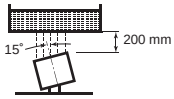
## ■ IEC (International Electrotechnical Commission) Standards IEC 60529: 1989-11

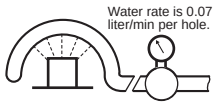
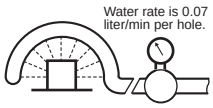
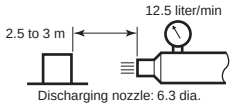
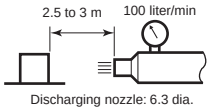
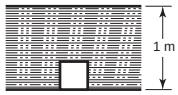



(A) First Digit: Degree of Protection from Solid Materials

| Degree | Degree | |
|---|---|---|
| 0 | | No protection |
| 1 | | Protects against penetration of any solid object such as a hand that is 50 mm or more in diameter. |
| 2 | | Protects against penetration of any solid object, such as a finger, that is 12.5 mm or more in diameter. |
| 3 |  | Protects against penetration of any solid object, such as a wire, that is 2.5 mm or more in diameter. |
| 4 | | Protects against penetration of any solid object, such as a wire, that is 1 mm or more in diameter. |
| 5 | | Protects against penetration of dust of a quantity that may cause malfunction or obstruct the safe operation of the product. |
| 6 | | Protects against penetration of all dust. |

(B) Second Digit: Degree of Protection Against Water

| Degree | Protection | | Test method (with pure water) |
|---|---|---|---|
| 0 | No protection | Not protected against water. | No test |
| 1 | Protection against water drops | Protects against vertical drops of water towards the product. | Water is dropped vertically towards the product from the test machine for 10 min.  |
| 2 | Protection against water drop | Protects against drops of water approaching at a maximum angle of 15°□to the left, right, back, and front from vertical towards the product. | Water is dropped for 2.5 min each (i.e., 10 min in total) towards the product inclined 15° to the left, right, back, and front from the test machine.  |

| Degree | Protection | | Test method (with pure water) |
|---|---|---|---|
| 3 | Protection against sprinkled water | Protects against sprinkled water approaching at a maximum angle of 60° from vertical towards the product. | Water is sprinkled for 10 min at a maximum angle of 60° to the left and right from vertical from the test machine.   |
| 4 | Protection against water spray | Protects against water spray approaching at any angle towards the product. | Water is sprayed at any angle towards the product for 10 min from the test machine.   |
| 5 | Protection against water jet spray | Protects against water jet spray approaching at any angle towards the product. | Water is jet sprayed at any angle towards the product for 1 min per square meter for at least 3 min in total from the test machine.   |
| 6 | Protection against high pressure water jet spray | Protects against high-pressure water jet spray approaching at any angle towards the product. | Water is jet sprayed at any angle towards the product for 1 min per square meter for at least 3 min in total from the test machine.   |
| 7 | Protection underwater | Resists the penetration of water when the product is placed underwater at specified pressure for a specified time. | The product is placed 1 m deep in water (if the product is 850 mm max. in height) for 30 min.   |
| 8 | Protection underwater | Can be used continuously underwater. | The test method is determined by the manufacturer and user. |

## ■ Oil resistance (OMRON in-house standard)

| Protection | |
|---|---|
| Oil-resistant | No adverse affect from oil drops or oil spray approaching from any direction. |
| Oil-proof | Protects against penetration of oil drops or oil spray approaching from any direction. |

Note: This OMRON in-house standard confirms resistance to cutting and other oils. It is equivalent to the former JEM standard.

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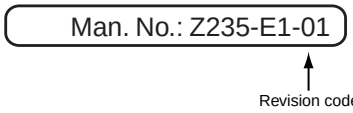
# Revision History

A manual revision code appears as a suffix to the catalog number at the bottom of the front and rear pages.




| Revision code | Date | Revised contents |
|---|---|---|
| 01 | April 2012 | Original production |

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